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PERFORMANCE ASSESSMENT AND COVERAGE EVALUATION (PACE) WORKSTATION: USER MANUAL

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16. ABSTRACT

The Performance Assessment and Coverage Evaluation (PACE) Workstation is a microcomputer-based tool to assist Omega Navigation System Center (ONSCEN) personnel in answering questions regarding Omega system performance. The workstation implements a probabilistic model of Omega system availability for user-selected coverage and other criteria. This memorandum provides information on the operation of the PACE workstation.

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METRIC CONVERSION FACTORS

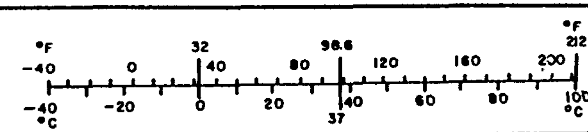
Approximate Conversions to Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
		LENGTH		
in	inches	*2.5	centimeters	cm
ft	feet	30	centimeters	cm
yd	yards	0.9	meters	m
mi	miles	1.6	kilometers	km
		AREA		
in^2	square inches	6.5	square centimeters	cm^2
ft^2	square feet	0.09	square meters	m^2
yd^2	square yards	0.8	square meters	m^2
mi^2	square miles	2.6	square kilometers	km^2
	acres	0.4	hectares	ha
		MASS (weight)		
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons (2000 lb)	0.9	tonnes	t
		VOLUME		
tsp	teaspoons	5	milliliters	ml
Tbsp	tablespoons	15	milliliters	ml
fl oz	fluid ounces	30	milliliters	ml
c	cups	0.24	liters	l
pt	pints	0.47	liters	l
qt	quarts	0.95	liters	l
gal	gallons	3.8	liters	l
ft^3	cubic feet	0.03	cubic meters	m^3
yd^3	cubic yards	0.76	cubic meters	m^3
		TEMPERATURE (exact)		
°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

*1 in ≡ 2.54 (exactly). For other exact conversions and more detailed tables, see NBS Misc. Publ. 286, Units of Weights and Measures, Price $2.25, SD Catalog No. C13.10 286.

Approximate Conversions from Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
		LENGTH		
mm	millimeters	0.04	inches	in
cm	centimeters	0.4	inches	in
m	meters	3.3	feet	ft
m	meters	1.1	yards	yd
km	kilometers	0.6	miles	mi
		AREA		
cm^2	square centimeters	0.16	square inches	in^2
m^2	square meters	1.2	square yards	yd^2
km^2	square kilometers	0.4	square miles	mi^2
ha	hectares (10,000 m^2)	2.5	acres	
		MASS (weight)		
g	grams	0.035	ounces	oz
kg	kilograms	2.2	pounds	lb
t	tonnes (1000 kg)	1.1	short tons	
		VOLUME		
ml	milliliters	0.03	fluid ounces	fl oz
l	liters	2.1	pints	pt
l	liters	1.06	quarts	qt
l	liters	0.26	gallons	gal
m^3	cubic meters	35	cubic feet	ft^3
m^3	cubic meters	1.3	cubic yards	yd^3
		TEMPERATURE (exact)		
°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F



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1. INTRODUCTION

The Performance Assessment and Coverage Evaluation (PACE) workstation was developed under the Omega System Performance Assessment, Phase II program. The PACE workstation implements a probabilistic model of system availability that provides quantitative measures of Omega navigation system performance. The analytical basis and significance of the system availability model used in PACE are given in Refs. 1 and 2. PACE also incorporates extensive scenario configuration and analysis capabilities for evaluating the Omega system under user-selected conditions and criteria. With PACE, users can selectively evaluate the effectiveness of the Omega system based on spatial and temporal signal variations. The analysis of PACE results is supported through a set of tools ranging from a summary global presentation of Omega signal availability to spatial and time-dependent signal properties displays. Comparative analyses for assessing changes in Omega system performance based on specific operational assumptions are also supported via visual displays and computational comparison utilities.

In general, *PACE has three main uses*:

1) to assess Omega system performance under nominal operational conditions
2) to analyze and explain unexpected and/or anomalous Omega system performance due to variations in operational conditions
3) to predict Omega system performance based on planned changes to overall system operations.

In addition, PACE may be used as a teaching aid for instruction in the operational and signal propagation characteristics of the Omega system. PACE was developed with the aim of supporting the analysis of Omega system performance. Therefore, a certain level of understanding of the Omega system and its operational characteristics is assumed and significant technical details of Omega are explained only as they pertain to PACE operation.

Omega system performance is represented in PACE by a quantity called the probability of system availability (P_{SA}). *P_{SA} is defined as the probability that at any point in space and time, the Omega signal can be successfully used for navigation.* The P_{SA} computation requires the transmitting station off-air probabilities and the specification of Omega signal usability (called signal coverage criteria) as input. Transmitting station off-air probabilities and signal coverage criteria are described further in Section 2.

The remainder of this user manual describes the features and use of PACE (Section 2) and provides a summary help section (Section 3) that is similar in content to the on-line help provided as an option in PACE operation. Whenever possible, it is recommended that this manual be utilized in conjunction with the PACE workstation operation so that the maximum benefit of the explanations and examples contained herein may be obtained.

2. DESCRIPTION OF PACE OPERATION AND FEATURES

This chapter explains the use of the various controls and setup options for PACE, documents the layout and content of PACE results, and illustrates the use of PACE in performing scenario analysis. The paragraphs that follow present PACE in a top-down fashion: detailed, technical information follows higher-level, generalized discussions of PACE capabilities and use.

2.1 OVERVIEW OF PACE OPERATION

At a high level, the main objective of PACE is to quickly present an assessment of overall Omega system performance based upon a set of predetermined conditions. This objective can be accomplished in three component steps: user input; Omega system availability model computation; and results display and analysis (illustrated in Fig. 2.1-1). Each of the three steps mentioned above is discussed in the following paragraphs. The information presented in this section provides an overview of the major components of the PACE system.

2.1.1 P_{SA} Model Computation

The result of the P_{SA} model computation indicates, for specific times, geographical regions, and for the globe, the probability that the Omega system can be successfully employed for navigation. For example, under a given set of user input parameters, PACE provides time-specific P_{SA} values at a "cell" (a minimum specifiable region of approximately 10° (latitude) x 10° (longitude)) for each of 24 hours over a one year period. PACE then aggregates the time-dependent quantities for specific cells into spatially-averaged P_{SA} values. Finally, a global-composite P_{SA} index that embodies the results of all time-dependent and geographic computations is formed.

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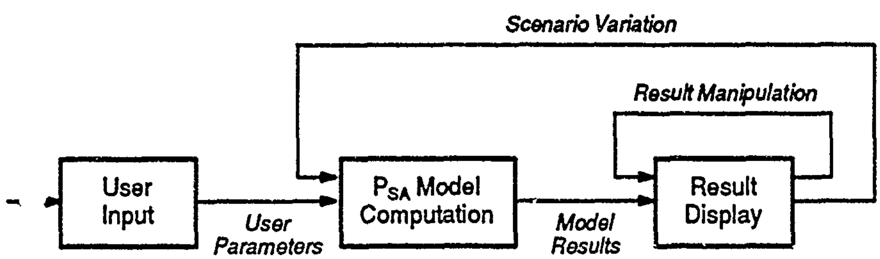

Figure 2.1-1 Overview of PACE Operation

The time-dependent P_{SA} values indicate that, given a specific cell and time (month/hour) within the year, an Omega user can expect to receive a sufficient number of navigationally usable Omega signals with a probability of P_{AT} (e.g., the probability of system availability at a specific time T). This value can range from zero (indicating that the probability of successfully utilizing Omega at that particular cell and time is zero) to one (indicating an absolutely certain ability to utilize Omega at that particular cell and time).

Spatially dependent probabilities of system availability that incorporate all time-dependent P_{SA} values for the times of interest are referred to as P_{AC} values (e.g., the probability of system availability for a particular cell on the globe). P_{AC} values again may range from virtually no chance of successfully utilizing the Omega system at the particular cell to a virtual certainty of success.

The global probability of system availability, P_{SA}, indicates the probability of successful use of the Omega system at any arbitrary point and time on the globe (again ranging from a probability of zero to one). The results of each of the three levels of P_{SA} computation are accessible within PACE to allow in-depth analyses of user-selected scenarios. Thus, for the conditions selected, the computation of a global probability of system availability proceeds in a bottom-up fashion by first building all time-dependent quantities for all cells, forming spatial P_{SA} values from the time-dependent results, and finally integrating over all space to obtain a global result. Figure 2.1-2 illustrates the P_{SA} computation approach used in PACE.

2.1.2 User Input Parameters

The computation and display of P_{SA} depends upon three classes of user input parameters: the probability that each station is off-air at a given time; the signal coverage parameters that specify/define the signal coverage criteria thresholds; and results thresholding and display parameters that control how PACE results are presented to the user. Table 2.1-1 lists the individual parameters that are contained in each of the three user input parameter classes. The significance of the parameters in each of the parameter classes and how they contribute to PACE operation as a whole is discussed in the following paragraphs.

2.1.2.1 P_{SA} Computation Parameters — P_{SA} computation parameters are defined in PACE as those quantities that form the basis of the P_{SA} probability computations. They are the station off-air probability set selector and the station reliability model selector. Figure 2.1-3 illustrates the use of the P_{SA} computation parameters. In PACE, three station-related probabilities are used in the computation of P_{SA}. the probability that the station will be off-air at a given time due to planned annual maintenance of the transmitter (called the maintenance off-air probability), the probability that a station will be off-air

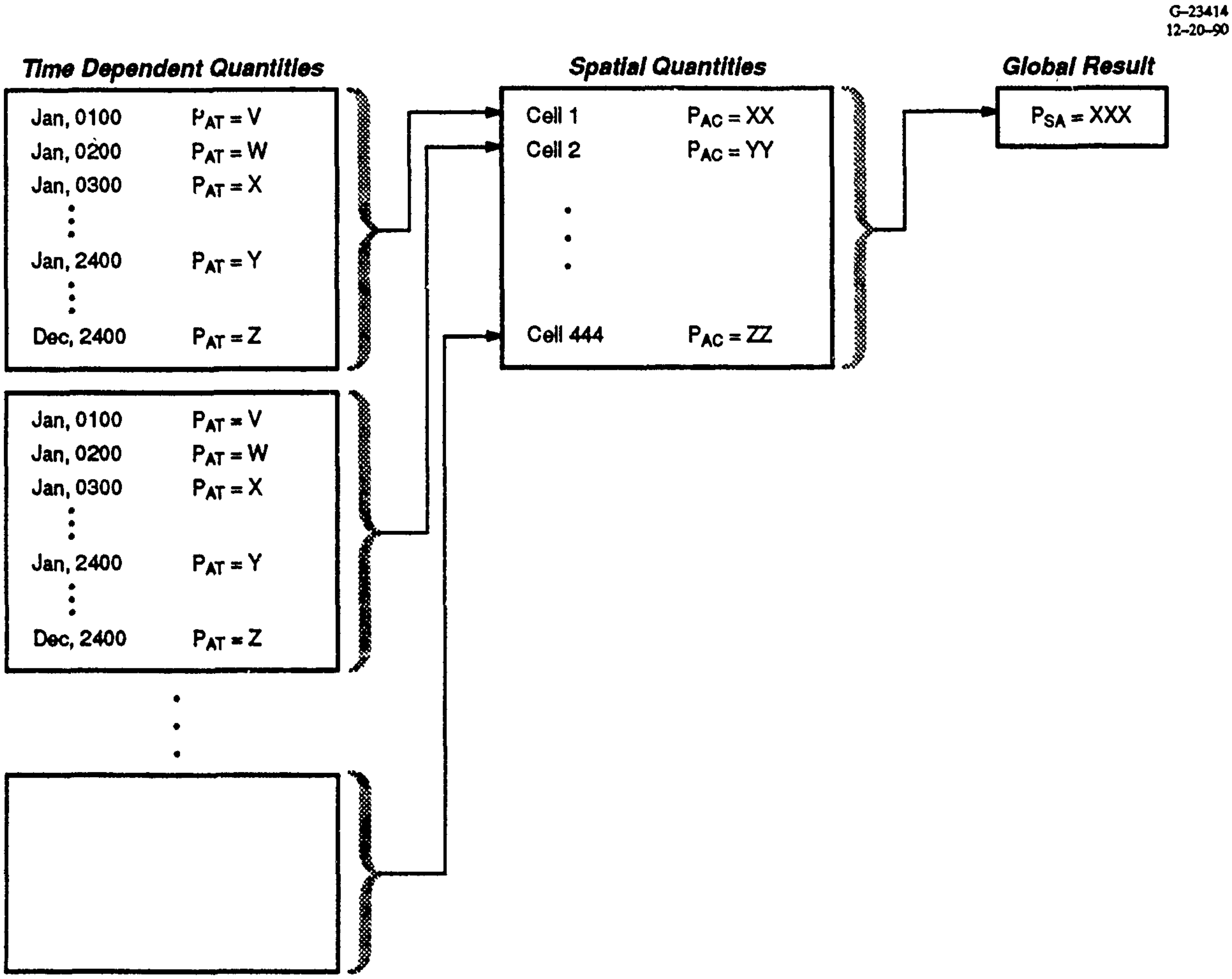

Figure 2.1-2 P_{SA} Model Computation

due to a foreseen interruption in transmission other than planned annual maintenance (called the scheduled off-air probability), and the probability that a station will be off-air due to an unforseen event (called the unscheduled off-air probability). These three probabilities are specified for each Omega station for each of the 12 months in any given year. (The three probability values are assumed to be constant over a month and are therefore not represented in any finer granularity in the P_{SA} computation model.) It is possible, then, to have several sets of these station probabilities that describe the reliabilities for the Omega stations for different years. In PACE, the user can select from any of a number of yearly sets of reliability figures to perform computations for a given or projected year.

Given that a particular station reliability set has been chosen for use in PACE computation, further specification on how the probability of an off-air due to planned maintenance is to be used can be made. In PACE, this specification is indicated by the station reliability model (SRM) and has three

Table 2.1-1 PACE User Input Parameters

	PARAMETER	DESCRIPTION	RANGE
P_{SA} Computation Parameters	Reliability	Station Reliability Set	Any file name
	SRM	Station Reliability Model	Best, nominal worst
Signal Coverage Parameters	SNR	Short Path Signal to Noise Ratio	-99dB to 99dB
	S/L	Short/Long Path Signal Ratio	-99dB to 99dB
	ANG	Path Terminator Crossing Angle	0 deg to 90 deg
	DEV	Short Path Signal Phase Deviation	0 cec to 50 cec
	DM	Mode 1 Dominance Check	off, on
	A-H	Station Power Level	off, on, -20dB to 20dB
	GDP	Geometric Dilution of Precision	0 to 25
	FRQ	Frequency	10.2kHz, 13.6kHz, and, or
Thresholding and Display Parameters	P_{SA}	P_{SA}, P_{AC}, P_{AT} Threshold	0.5 to 0.999
	Month	Months of Interest	Jan to Dec
	Hour	Hours of Interest	0100 to 2400
	REP	Result Reporting Method	Minimum, Mean, Maximum
	Weights	Weights and Region Definitions	0 to 9, on, off

options: best, nominal and worst case. For the *best case option*, it is assumed that *no* stations will be off-air due to planned annual maintenance for any part of any month. Selecting the best case for the station reliability model gives an optimistic view of the overall availability of the Omega system as a whole, and of individual stations in particular. The *nominal station reliability mode option* makes use of the planned annual maintenance off-air probabilities as they are given in the reliability set. Selecting the nominal SRM case, then, results in system availability values that are influenced by the actual station

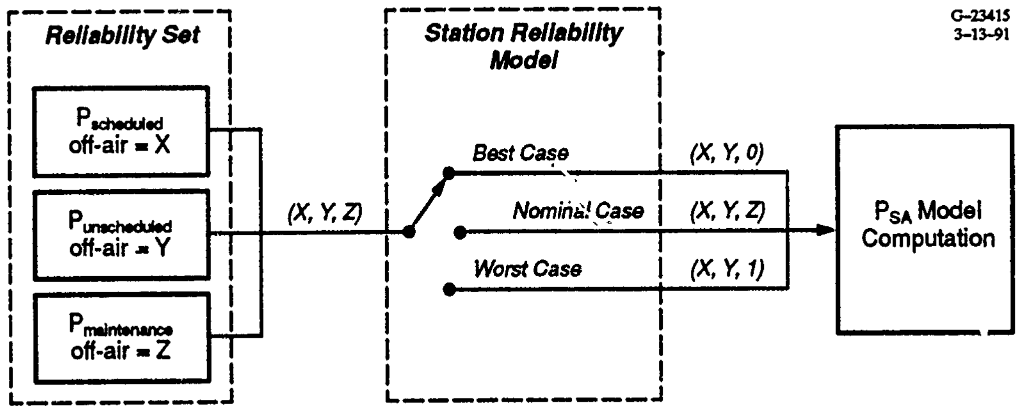

Figure 2.1-3 P_{SA} Model Computation

maintenance periods. The *worst case SRM selection* assumes that *any* station with a non-zero maintenance probability for a given month will be off-air for the entire month, not just a portion of the month. This selection essentially presents a worst-case scenario that a user may experience if any of the scheduled annual maintenance periods are in effect during the times of interest. The combination of the off-air station probabilities and the station reliability model allow the user to 1) experiment with the effects of various off-air schedules, 2) evaluate the range of sensitivity of the system availability quantities to changes in the off-air schedules, and 3) assess the bounds of Omega system performance.

2.1.2.2 Signal Coverage Parameters — The second class of user input establishes the criteria that are used to judge Omega signal coverage. In PACE, the coverage criteria are broken into two sets: "standard" criteria and supplementary criteria. Figure 2.1-4 illustrates the use of the criteria in the PACE coverage calculation. Each criterion is discussed below.

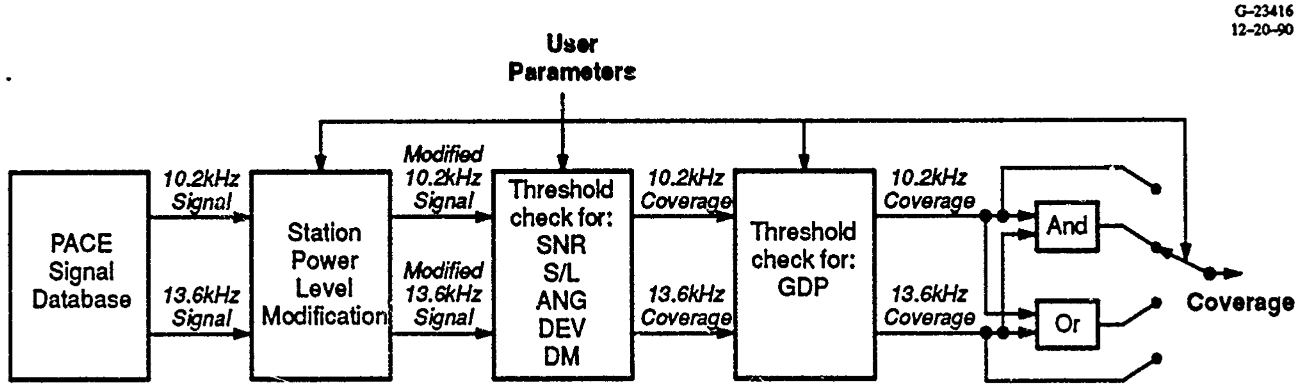

Figure 2.1-4 PACE Coverage Calculation

A station is said to cover a given cell at a given time if the following five standard coverage conditions are met:

1) The short-path signal-to-noise ratio (SNR) is greater than or equal to a given threshold (nominally -20 dB)
2) The short-path-to-long-path signal ratio is greater than or equal to a given threshold (nominally 6 dB)
3) The short-path/terminator crossing angle is greater than or equal to the user-selected threshold (nominally 5 degrees)
4) The short-path signal phase deviation is less than or equal to a given threshold (nominally 20 cec)
5) The Mode 1 amplitude of the short-path signal exceeds (i.e., dominates) the sum of all other short-path signal modes by a given threshold (set to 6 dB in PACE).

The last two conditions are often referred to together as the *modal criteria*. In essence, if a station is said to cover a particular geographical location at a specific time, then that station's signal is assumed to be sufficient to be used by an Omega navigation receiver. In order to successfully navigate using Omega at a particular geographic location and time, a minimum of three Omega stations must "cover" the point of interest (with "good" geometry.) In PACE, the particular combination of covering stations for a particular geographic location and time is called a coverage set.

Each of the threshold values for the above quantities (with the exception of the Mode 1 dominance threshold) is selectable by the user. The predicted signal parameters that are used to compare against the thresholds are contained in the PACE signal database. Thus, for all transmitting stations and for each time and geographic location of interest, the database values are compared against the user-selected thresholds to determine coverage. In its nominal configuration, PACE applies the coverage criteria thresholds equally to all stations under consideration (e.g., all station signals are checked against the same threshold values).

In addition to the standard coverage criteria discussed above, PACE has several other selections that supplement the use of the five standard criteria. These consist of 1) individual selections of the transmitted power at each of the eight Omega stations (and consequently the SNR values for each station), 2) assessment of the Geometric Dilution of Precision (GDOP) for a given coverage set configuration, 3) the selection of individual or combinations of the signal frequencies contained in the PACE signal database, and 4) the elimination of the Mode-dominance criterion from the coverage calculation. Discussions of how each of these additional selections affect the coverage computation follow.

As discussed earlier, each of the five standard coverage criteria are nominally applied equally to all eight Omega transmitter signals. It is possible in PACE, however, to individually *alter the transmitted power level* at the transmitter (or equivalently, the received power level) for each station's signal. This is implemented in PACE by allowing the user to input a *power level deviation from nominal (ranging from -20 dB to +20 dB) for each of the eight Omega stations*. Thus, the SNR value from the PACE signal database for the cell and time of interest is combined with the station power level deviation. For example, for a given station with a SNR value of -10 dB from the PACE signal database, a SNR threshold of -5 dB, and a power level deviation of +10 dB, the SNR criterion would pass (-10 dB + 10 dB = 0 dB which is greater than the threshold of -5 dB). The deviation from nominal station power input parameter allows the user to experiment with scenarios where the transmitted output of a station may be reduced or increased to adjust for other operational changes. In addition to selecting a deviation from nominal station power, *each station may also be selectively turned off* for a P_{SA} computation. This has the effect of excluding that particular station from the coverage calculation for all geographic locations and times. Thus, a user may experiment with the situation where a station may be non-operational for an extended period of time.

The *Geometric Dilution of Precision (GDOP)* calculation in PACE considers the geometry of the transmitting stations in a given coverage set relative to the location of the receiver. The result of the GDOP calculation in PACE is a dimensionless value that gives a qualitative indication of the usability of the received signals given the relative positions of the receiver and the stations in the coverage set. For example, if a given point on the globe is covered by three stations (e.g., three of eight stations satisfy the standard coverage criteria) but two of the three stations lie on nearly the same great circle path as the receiver, then the signal arrival geometry may be such as to magnify phase errors into unacceptably large position errors. The GDOP value threshold selector, then, instructs PACE to flag positions where the GDOP for the station coverage set under consideration does not meet the user criterion. *The user-selected GDOP threshold values range from zero to 25*, with smaller numbers indicating a station coverage set of good geometric configuration, and larger numbers indicating a station coverage set of poor geometric configuration. Thus, in addition to the standard coverage criteria discussed above, GDOP is also considered in PACE as a final check on coverage. If, for a given cell/time, a given coverage set exhibits a GDOP that is above the user selected threshold, then PACE does not include that particular cell for the time of interest in the system availability calculation.

The PACE signal database contains spatially and time dependent signal information for the 10.2 kHz and 13.6 kHz signal frequencies. When executing a PACE scenario, *the user may choose either*

1) the 10.2 kHz signal

2) the 13.6 kHz signal
3) the logical AND combination of both the 10.2 kHz and 13.6 kHz signals
4) the logical OR combination of both the 10.2 kHz and 13.6 kHz signals.

Choosing either the 10.2 kHz or 13.6 kHz frequency causes PACE to compute coverage based only on the signal characteristics for the frequency selected. Choosing the logical AND of both frequencies causes PACE to consider a particular cell at a specific time to be covered by a station only if both the 10.2 kHz AND the 13.6 kHz signals cover the point. This is the most restrictive case and provides more conservative P_{SA} results compared to the other frequency choices. Choosing the logical OR of both frequencies causes PACE to consider a particular cell at a specific time to be covered by a station if either the 10.2 kHz OR the 13.6 kHz signal is covering the point. This is the least restrictive case and will provide less conservative P_{SA} results compared to the other frequency choices.

When calculating coverage based upon the standard coverage criteria mentioned above, it may be desirable to *exclude the Mode 1 criteria* from consideration. This can be accomplished in PACE by turning off the dominant mode check (e.g., the standard coverage criterion that checks Mode 1 dominance), thereby basing the coverage computation only on short path SNR, short/long path signal ratio, path/terminator crossing angle, and phase deviation.

2.1.2.3 Thresholding and Display Parameters — After the system availability quantities have been computed, the *thresholding and display parameters* govern how the results will be represented on the screen. This third class of parameter selections allows the user to tailor the display thresholds for the probability of system availability values, to select hours and months that are of interest, to choose the method for computing time- and space-dependent values P_{AT} and P_{AC}, and to compute statistics for user selected regions on the globe. Figure 2.1-5 shows how the display parameters are used. Each parameter is discussed below.

The PACE *result displays are all color coded* so that the user can quickly spot problem areas where the computed values fall below the user-selected P_{SA} threshold. After a scenario has been computed, the display of the spatial and time dependent computations (the P_{SA} and P_{AT} quantities) are colored (red) if the results fall below the user-selected P_{SA} threshold. The P_{SA} threshold parameter is useful to find the performance levels below which the regions or times of interest exhibit poor Omega performance.

The computation of the geographic and global P_{AC} and P_{SA} values can be performed such that only specific hours and months of interest are included in the calculation. PACE provides this capability through *hour and month selectors* that allow the user to select any combination of hours for a given set of

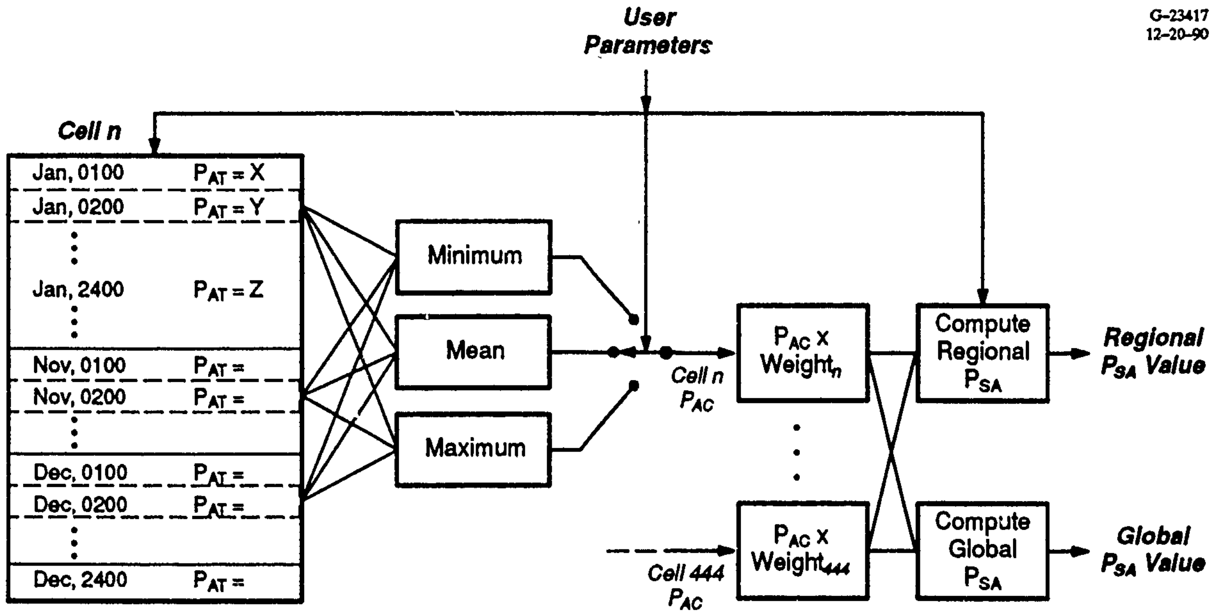

Figure 2.1-5 Thresholding and PACE Display Computations

months.* Thus, users can tailor scenarios to only consider certain periods of the year (e.g., the winter months), and certain times for the days within that period (e.g., only the nighttime hours during the winter).

Nominally, the *mean of all time specific system availability values* (i.e., the P_{AT} values) for the times of interest at a particular cell is used to represent the system availability value for that cell (i.e., the P_{AC} values). PACE also nominally uses the mean P_{AC} values to compare against the user-selected P_{SA} threshold in order to color the resultant geographic locations as described earlier. Additional user parameter selections allow the user to choose either the minimum or the maximum value of the time-specific system availability values (i.e., the P_{AT} values) for the times of interest at a particular geographic cell to represent the system availability value for that cell (i.e., the P_{AC} values). Using the *minimum value selection* will cause PACE to report the most conservative or worst case values for cell-specific (P_{AC}) and global (P_{SA}) values. The minimum selection essentially states that, for the cell and times selected, the reported system availability value (P_{AC}) is the worst (lowest) system availability value for any of the times selected. Using the *maximum value selection* will cause PACE to report the least conservative or best-case values for cell-specific (P_{AC}) and global (P_{SA}) values. The maximum selection essentially states that, for the cell and times selected, the reported system availability value for that location (P_{AC}) will be the best (highest) system availability value for any of the times selected.

*However, the hour combinations must be the *same* for all months selected

For any given scenario, a particular region of the globe may be assigned relatively more or less importance for Omega utilization in comparison to other regions. For example, a scenario that addresses Omega system performance in the North Atlantic may emphasize that region while de-emphasizing other regions. This can be accomplished in PACE by selecting *weight values* for specific geographic cells. The weight values that may be selected range from zero (i.e., do not include this location in the global P_{SA} computation) to nine (i.e., weight the results from this location heavily in the global P_{SA} computation). The set of assigned weights are normalized over the globe so that regions with higher relative weights contribute proportionally more than regions with lower weights. This mechanism allows the user to compute realistic scenarios that emphasize regions of heavy Omega usage and that de-emphasize regions of light or non-existent Omega usage. In addition to assigning weights to geographic regions on the globe, PACE users can also select a region (groups of cells) for which separate P_{SA} statistics are calculated. This capability provides the user with two sets of reported P_{SA} statistics, one for the entire globe and one for the region selected. The weights for the cells within the selected region are also normalized and used in the calculation of region results.

2.1.3 Results Display and Analysis

The results of PACE computations are presented to the user in a variety of graphical and numeric displays. This section describes the information that is presented in the various result displays and also explains the format of the display screens. Discussions in this section concentrate on those displays that show the various aspects of the P_{SA} model results. Additional detail on the remaining input and configuration displays is provided in later sections. The main result display screens are: 1) the status display bars, 2) the cell display, 3) the summary cell query display, 4) the detailed cell query display, 5) the coverage display, and 6) the difference display.

2.1.3.1 Status Display Bars — Figure 2.1-6 is a picture of the PACE base display showing the cell display and the status bars. There are two status bars associated with each of the PACE scenario result screens, the *lower status bar* and the *side status bar*. The bars together contain all of the information that is necessary to reconstruct the scenario that is currently shown on the cell display, including all user input parameters and PACE system files that are in use. In addition, the lower status bar presents statistical summary results of the P_{SA} calculation for the scenario under consideration.

As shown in Fig. 2.1-6, the *lower status bar* contains four rows of alphanumeric information pertaining to the user-selected parameters and scenario results. *The first item in the top row* indicates the user-selected result reporting method (i.e., minimum, mean or maximum) as discussed earlier in Section 2.1.2.3. The *next eight items* indicate the power level deviations that are selected for each of the

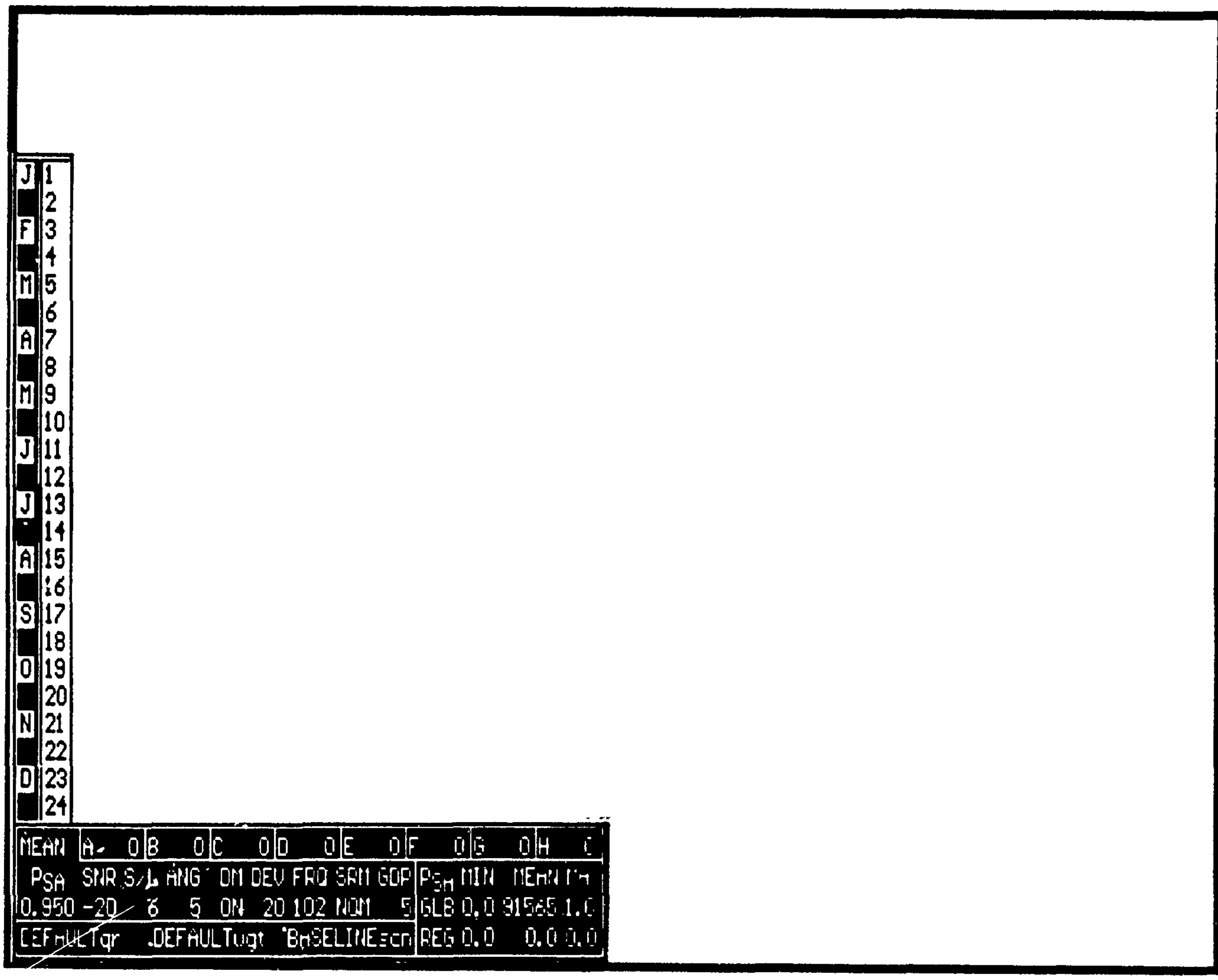

Figure 2.1-6 Status Display Bars

eight Omega station signals (see Section 2.1.2.2 for a discussion of these selections). The *second and third rows* on the left hand side of the lower status bar contain the names and user-selected threshold values for the various P_{SA} computation, signal coverage, and threshold and display parameters (discussed in Sections 2.1.2.1, 2.1.2.2, and 2.1.2.3). The *bottom line on the left hand side* of the lower status bar indicates the files that are currently in use by PACE. These are, in left to right order, the name of the file that contains the station off-air probability set for the year in question (see Section 2.1.2.1 for a discussion of these quantities), the name of the file that contains the geographic weighting and region definitions for the scenario (see Section 2.1.2.3) and the name of the archived scenario file (if any) that is currently being used. A description of the creation and use of these files is contained in Section 2.2. The *box on the* *right hand side* of the lower status bar contains a table of summary P_{SA} results for both the globe and for a user-selected region. For both the globe and user-selected region, the minimum system availability value for all times under consideration (i.e., the minimum P_{AT} value for the times of interest), the mean system availability value for all times under consideration (i.e., the mean of the $\bar{P}_{AT}$ values for the times under consideration) and the maximum system availability value for all times under consideration (i.e., the maximum P_{AT} value for the times of interest) are reported. As mentioned earlier, the global P_{SA} statistics consider all geographic locations whereas the regional P_{SA} statistics only consider those areas that are within the user specified region.

The *side status bar* shown in Fig. 2.1-6 contains two columns of information that show additional thresholding and display parameter selections. The left-hand column indicates the selected months for the scenario of interest. The right-hand column indicates the hours within the selected months that are included in the system availability computation. Note that a particular hour selection applies to all months selected. The combination of the side and lower status bars completely define the conditions for the scenario of interest. Thus the scenario input parameters can be documented along with any of the scenario result display screens by simply printing the screen.

2.1.3.2 The Cell Display — The primary display output for graphical system availability results is the cell display. Figure 2.1-7 shows the PACE base screen that contains a cell display with typical scenario results. The *cell display* divides the globe into 444 (approximately equal-area) cells that are roughly 10 degrees by 10 degrees in size. In PACE, the cell is the minimum spatial resolution for which computations are performed. The various Omega signal parameters contained in the PACE signal database are assumed to be constant within a cell and represented by the value at the cell center. Also, geographic weights and region definitions are handled at the cell level.

The display of P_{SA} computation results is shown at the cell level, with each cell's individual system availability value (P_{AC}) compared against the user selected P_{SA} threshold to obtain the appropriate cell color. Cells whose P_{AC} values fall below the user selected P_{SA} threshold are colored red; those which meet or exceed the threshold are colored blue. The cell display, then, provides a spatial representation of the probability of Omega system availability for the user parameters selected. This display is useful as a quick, visual means of assessing the overall impact of specific Omega system operational conditions. It also allows for the quick detection of significant problem areas by showing those cells in a highlighted color (red).

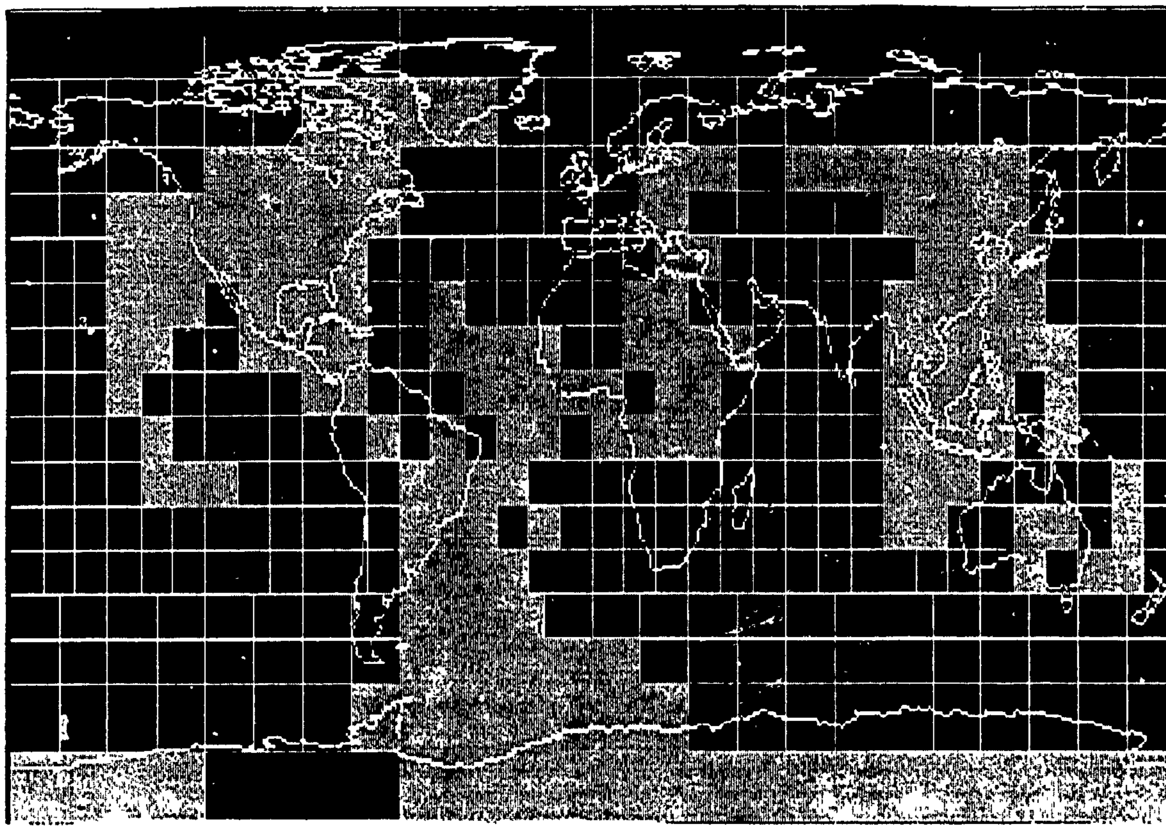

Figure 2.1-7 The PACE Cell Display

In addition to showing the cell level results of the system availability calculation, the cell display also indicates cells that the user has included in the region definition. The region cells are indicated with a highlighted border. The region statistics contained in the lower status bar correspond to the cells that are highlighted as region cells.

The cell display also provides a latitude/longitude indicator to assist users in determining Omega system performance at specific geographical locations. The user may pinpoint a specific latitude and longitude by simply moving the on-screen cursor until the desired latitude/longitude values are achieved.

2.1.3.3 The Summary Cell Query Display — Once a scenario has been processed and displayed on the cell level display, more detailed information may be obtained by using summary cell queries. This is accomplished by selecting a geographic cell of interest on the cell level display. The resultant *summary cell query display*, illustrated in Fig. 2.1-8, shows a month/hour, color coded matrix that indicates whether the P_{AT} value for the months and hours of interest pass the P_{SA} threshold value. The geographic cell selected for summary cell query is highlighted so that the user can easily identify the cell corresponding to the time-dependent information. On the summary cell query display hour/month matrix, the columns/rows (months/hours) that correspond to the user selected hours/months are indicated

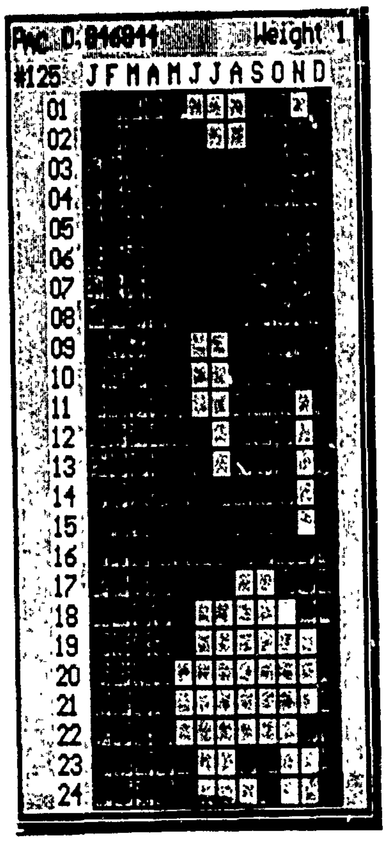

Figure 2.1-8 The Summary Cell Query Display

brightened cell colors, making identification of the times of interest easier. In addition to the hour/month matrix, the summary cell query display also shows the cell identification number that the information pertains to, as well as the P_{AC} value for the selected cell and selected P_{SA} statistics (e.g., min, mean, or max). As discussed earlier, the cell level system availability value (P_{AC}) is formed by taking the minimum, mean, or maximum for all hour/month P_{AT} values for the selected times. Thus the displayed P_{AC} value is derived from the P_{AT} values for the brightened hour/month cells on the summary cell display.

The summary cell display is useful for observing temporal variations in Omega system performance. The matrix of displayed hours/months gives an indication of seasonal and diurnal P_{SA} variations for the selected geographic cell.

2.1.3.4 The Detailed Cell Query Display — Detailed cell queries are supported in PACE to provide detailed infomation on station coverage and signal characteristics for the specific geographic cell and hour/month selected. The information contained on the *detailed cell query display* provides insight into the causes of the reported Omega system performance for the location and time of interest. The display combines raw PACE signal database information (e.g., individual signal coverage parameters) and intermediate P_{SA} model results (e.g., coverage set information) for use in detailed analysis. The detailed cell query display is activated by selecting an hour/month cell for further information on the hour/cell matrix of the summary cell query display. There are actually two parts to the detailed cell query process, obtaining station coverage information and obtaining signal characteristics for a specific station. Each is discussed below.

When a specific hour/month on the summary cell query display matrix is chosen, the *top half of the detailed cell query display* is activated (see Fig. 2.1-9). This portion of the display indicates the P_{AT} quantity for the hour/month selected, the set of covering stations for the location and time of interest, the GDOP value for that set of covering stations, and the hour/month selected. The P_{AT} value displayed determines the color (for a given P_{AT} threshold) for the corresponding hour/month cell on the summary cell query display matrix. Each of the eight Omega transmitting stations is represented by a boxed letter, and those that cover the selected point for the time indicated are colored yellow. The displayed coverage set is used as input to the GDOP calculation, and also as input to the P_{SA} computation. For coverage sets that contain less than the required three Omega signals, and for GDOP values that fail to meet the user-specified threshold, the P_{AT} value is set to zero. Otherwise, the displayed P_{AT} value is obtained from the execution of the P_{SA} model discussed earlier.

Further information on each of the eight Omega signals may by obtained by selecting a particular station to view. Doing so activates the *lower half of the detailed cell query display*. The resulting display,

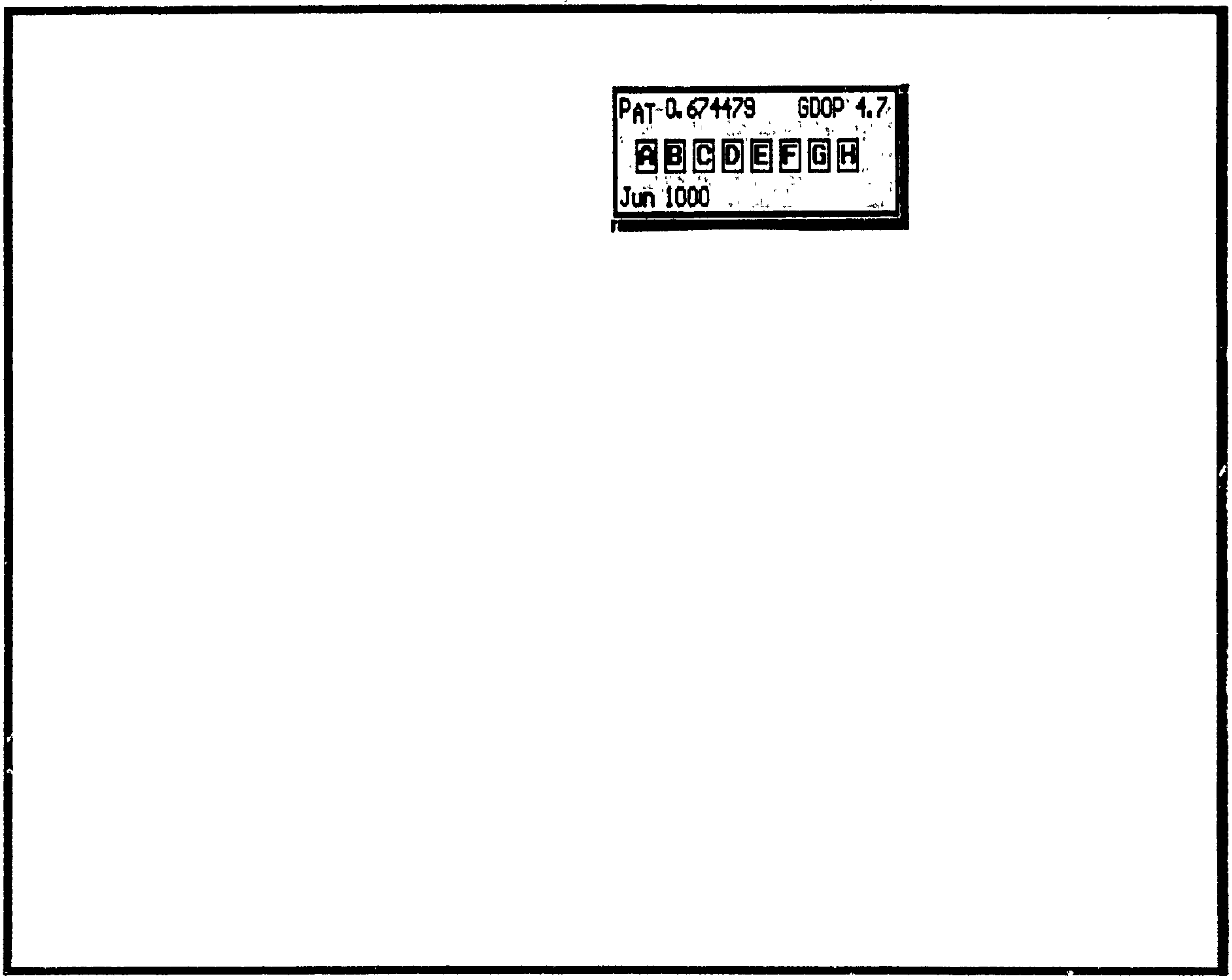

Figure 2.1-9 Coverage Portion of the Detailed Cell Query Display

shown in Fig 2.1-10, contains information about the various signal parameters for the selected station for both the 10.2 kHz and 13.6 kHz frequencies , the reliability of the selected station, and the name of the station whose information is being displayed. Station signal information is obtained from the PACE signal database and includes the values for signal-to-noise ratio (reported in dB), short-to-long path signal ratio (in dB), Mode 1 dominance (where 1 indicates Mode 1 dominates and X indicates that Mode 1 does not dominate), phase deviation (in centicycles), and path/terminator crossing angle (in degrees), for the cell and time of interest. Each of these quantities is color-coded to indicate whether the value passed (shown in blue) or failed (shown in red) the corresponding coverage criterion. The use of color allows the immediate identification of any quantity that does not meet the corresponding coverage criterion. The

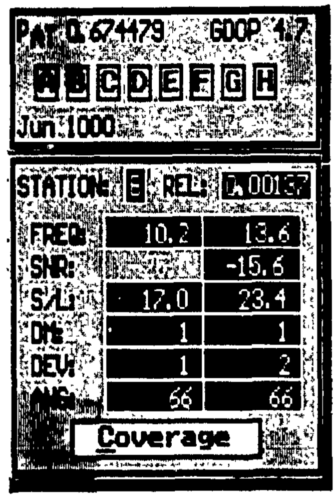

Figure 2.1-10 Detailed Cell Query Display Showing Signal Database Information

reliability value presented on the lower half of the detailed cell query display shows the combined probability of the selected station being off-air at the time of interest. This value represents the sum of the probability of a scheduled off-air, the probability of an unscheduled off-air, and the probability of planned maintenance.* This information is useful when investigating an apparently low P_{AT} value for the given coverage set, because one of the covering stations may have a high probability of being off-air. The quantities shown in the lower half of the detailed cell query display provide a means for judging the sensitivity of a time-dependent system availability value to variations in the signal characteristics.

*The combined probability is the sum of the component probabilities since the events are mutually exclusive.

2.1.3.5 The Coverage Display — Coverage diagrams which show signal characteristics for a specific time over the entire globe are useful for determining the spatial characteristics of a particular station's signal. In PACE, a *coverage diagram* for a specific time and station may be obtained by selecting the coverage control on the detailed cell query display. Figure 2.1-11 illustrates the PACE coverage display. The display shows, for a specific station/month/hour combination, cells for which the signal coverage thresholds are exceeded/not exceeded for the standard coverage criteria. The cell values are represented as follows:

1) Signal to noise ratio below the user-selected threshold is indicated by displaying the cell in red

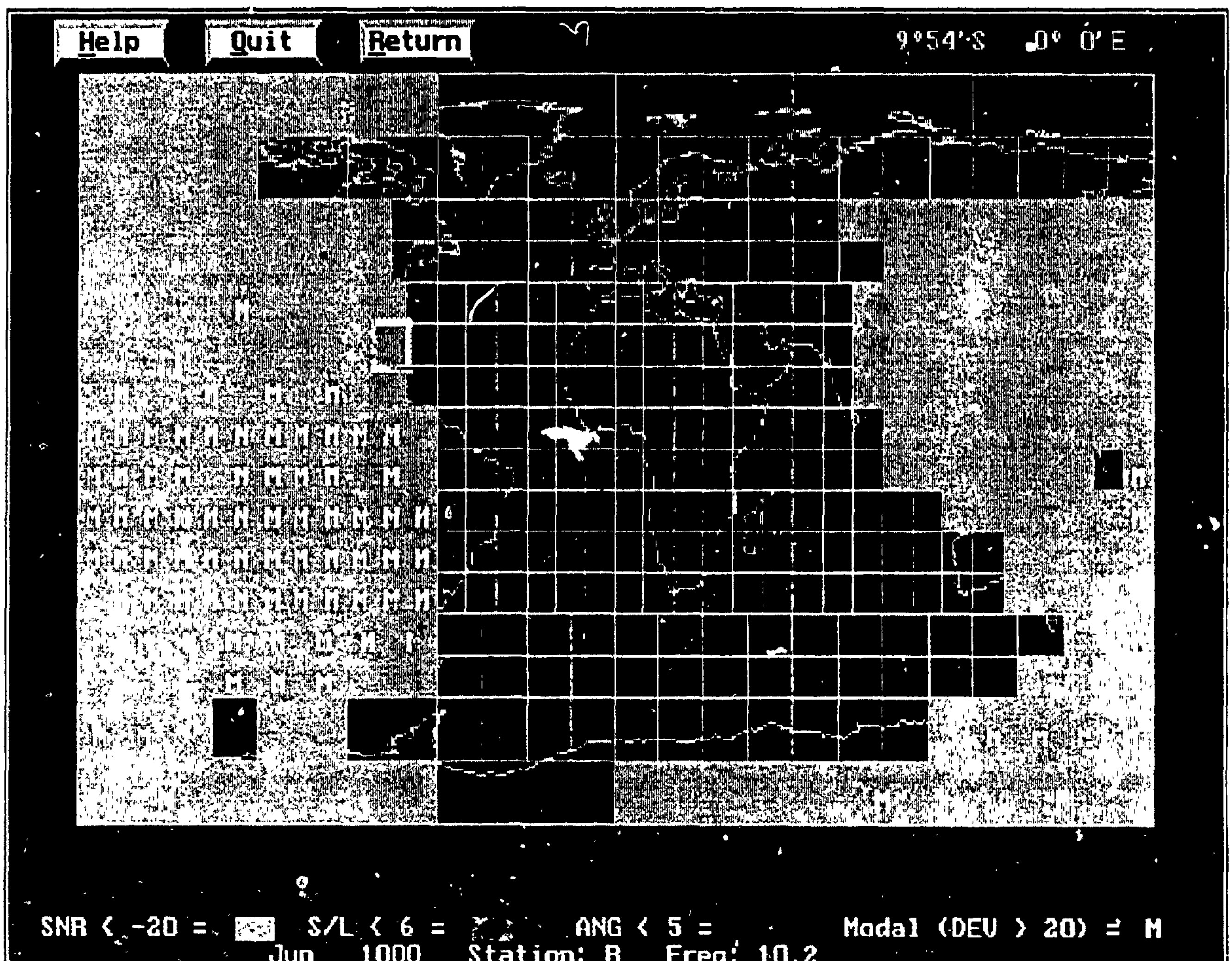

Figure 2.1-11 Coverage Display

2) Short-path-to-long-path signal ratio below the user-selected selected threshold is indicated by displaying the cell in light red (this information is overridden if the SNR criteria is not met)

3) Modality (the combination of the Mode 1 dominance check and the phase deviation criterion) is indicated by an M in the cell center

4) Crossing angle below the user selected threshold is indicated by an X across the cell.

As mentioned above, the SNR indication will over-ride the short/long path ratio indication. Thus, if a particular cell exhibits both an SNR and short/long path ratio criteria failure, only the SNR failure will be shown (i.e., the cell will be colored red). Also, the modal criteria combines the Mode 1 dominance check and the phase deviation check so that if either check fails to meet the user specified threshold, the cell will be flagged as modal. As a reference back to the user-selected coverage parameters, the coverage criteria thresholds are shown at the bottom of the coverage display in addition to the station and time for which coverage is shown. Also, the geographic cell queried on the cell display is highlighted so that the user can gain a perspective of coverage in nearby locations. The coverage display, then, is the primary PACE tool whereby an analyst can observe spatial variations in coverage for a specific station at a specific time.

2.1.3.6 The Split Screen and Difference Display — There are two fundamental methods available in PACE for assessing the differences between two P_{SA} scenarios: split screen and differencing. The first, the *split screen display* shown in Fig. 2.1-12, allows the user to simultaneously view two scenario cell displays in side-by-side windows on the screen. For each of the two scenarios shown, the split screen display provides all of the information present in the cell display, as well as all of the query capabilities described in Sect. 2.1-3. In the split screen case, each screen half is a fully functional cell display.

The second comparison utility, the *difference screen* illustrated in Fig. 2.1-13, is used to compute and display statistical changes in the cell level P_{AC} values. The main portion of the difference display consists of a cell display that is color-coded to show percentage changes in the values of the cell P_{AC} quantities for the two scenarios that are contained in the split screen cell displays. Also, the difference display contains the full lower and side status bars for both scenarios.

In the difference display, each cell represents the relative change in P_{AC} from the scenario shown in the left hand part of the split screen display to the scenario shown in the right hand part of the split screen display. The relative change is calculated using one of three methods:

1) The increase or decrease in the cell level system availability (P_{AC}) from the left to the right hand scenario

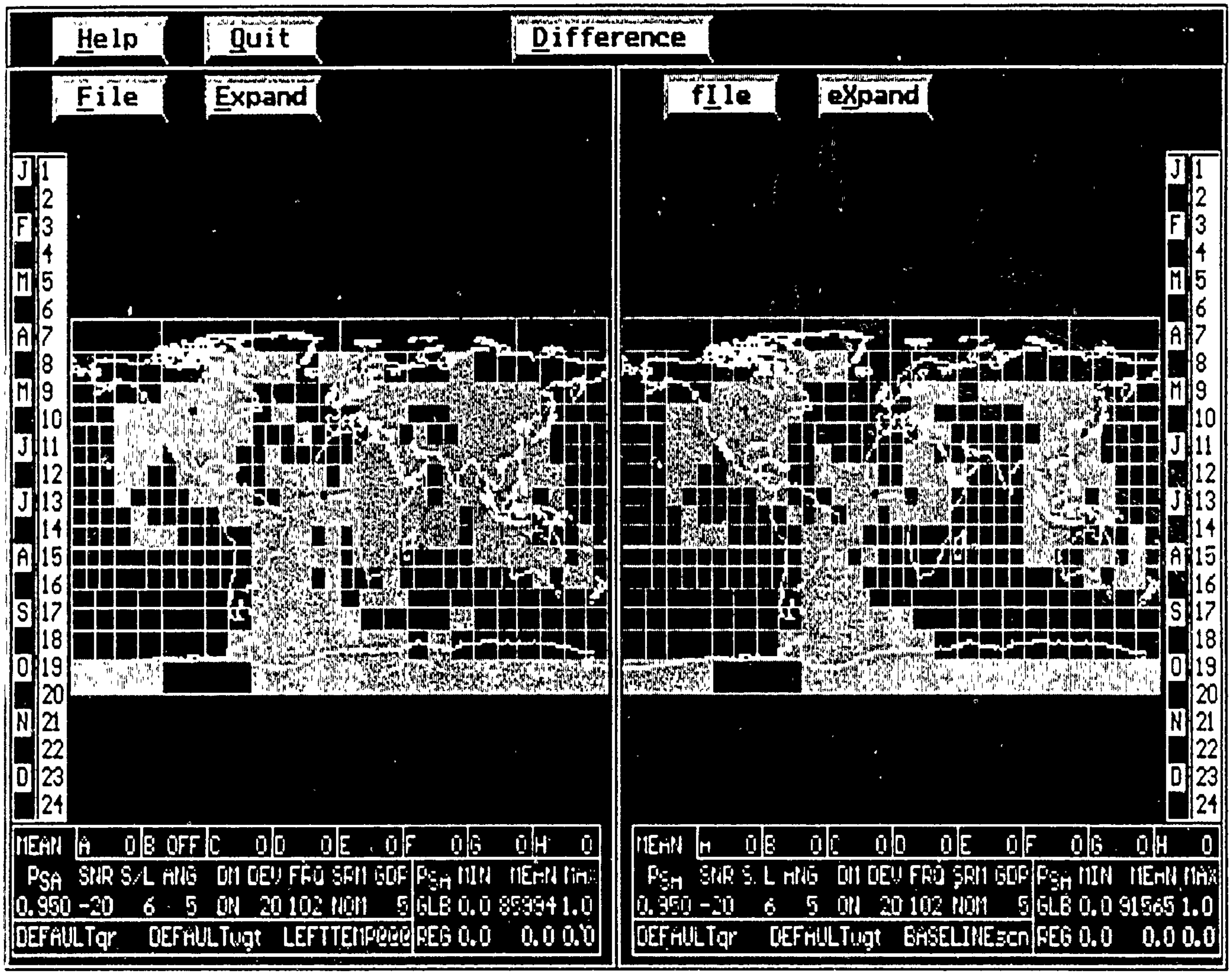

Figure 2.1-12 Split Screen Display

2) The percentage increase or decrease in the cell level system availability (P_{AC}) from the left to the right hand scenario

3) The percentage increase or decrease in the cell level system unavailability (P_{AC}) from the left to the right hand scenario.

Each cell in the difference display is color-coded according to whether the computed difference falls above or below user selected difference thresholds. For comparing scenarios, *the main objective is to observe where the system availability values degrade*, where they improve, and where they remain within some bounded range (determined by the user). PACE supports this objective by providing *two user selectable threshold values* that the determine the *upper and lower limits* on the bounded range.

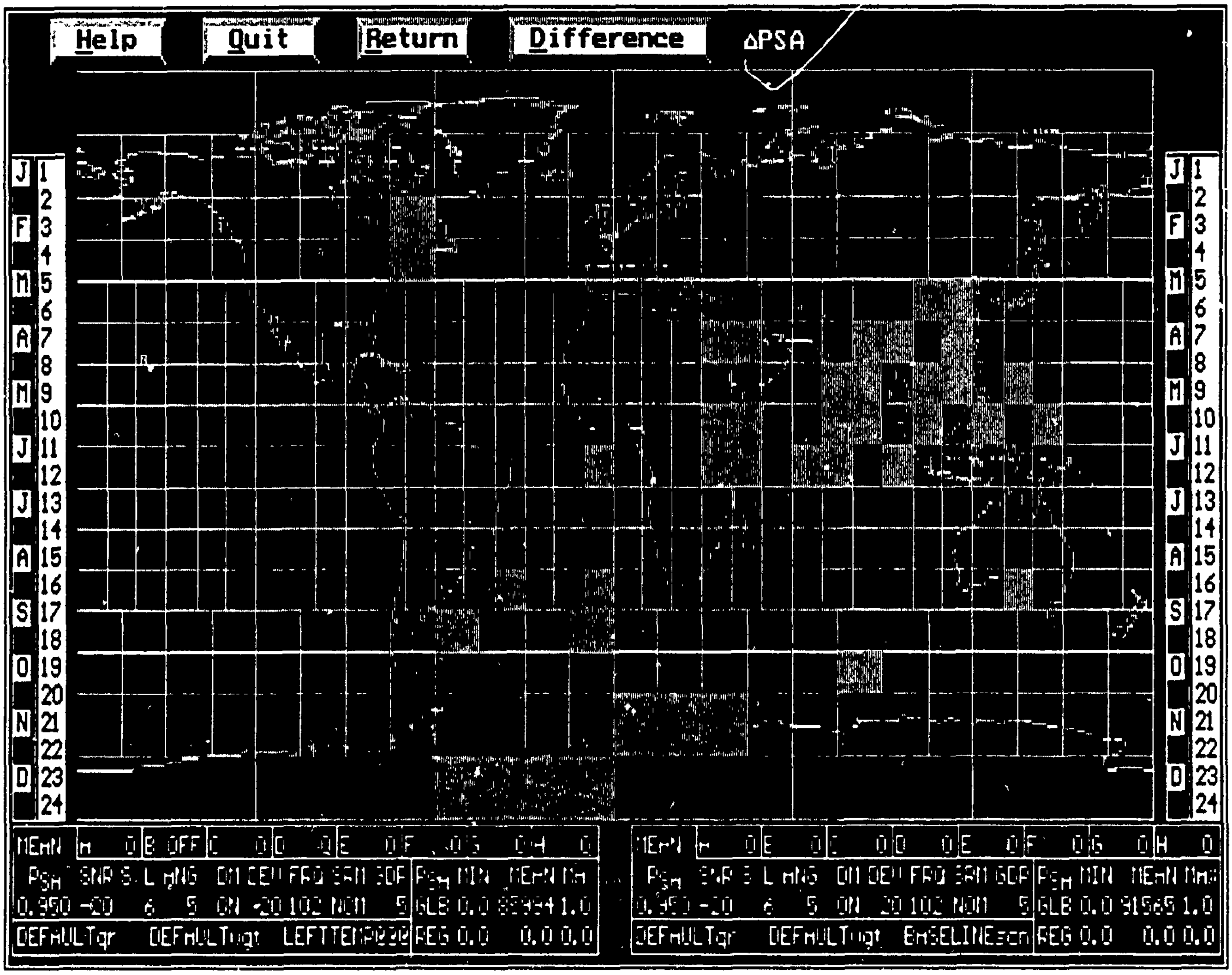

Figure 2.1-13 Difference Screen Display

Thus, each cell in the difference display is colored according to whether it falls below, between, or above the user defined range. The cell display scheme is as follows:

1) Cells whose change falls below the lower bound threshold are colored red
2) Cells whose change falls between the lower bound and upper bound threshold are colored blue
3) Cells whose change falls above the upper bound threshold are colored green.

The use of the split and difference displays together provide a powerful set of tools for assessing Omega system performance changes due to variations in Omega operational parameters. As with the other PACE result displays, all pertinent scenario information is fully presented along with the computed P_{SA} results.

2.2 EXAMPLES OF PACE OPERATION

This section contains examples of several levels of PACE operation ranging from basic PACE scenario processing to advanced processing and analysis. Four examples are presented: 1) baseline scenario computation (Fig. 2.2-1), 2) a variation on the baseline scenario (Fig. 2.2-2), 3) advanced scenario processing (Fig. 2.2-3), and 4) how to build a reliability set (Fig. 2.2-4). Each example is presented as a graphical flow chart that contains the following three types of items:

1) square boxes containing descriptions of the scenario objectives
2) ellipses containing references to the detailed PACE operation instructions in Section 3 of this User Manual
3) images of the corresponding PACE screens for each step in the example.

The presentation of scenario examples is intended to guide the user through the steps required for each objective. The examples provide operational templates that can be used as a baseline for specific scenario execution. As such, they provide nominal parameter values and operational sequences. Users are encouraged to experiment with the various PACE features while using the examples presented herein as representative of typical PACE operation.

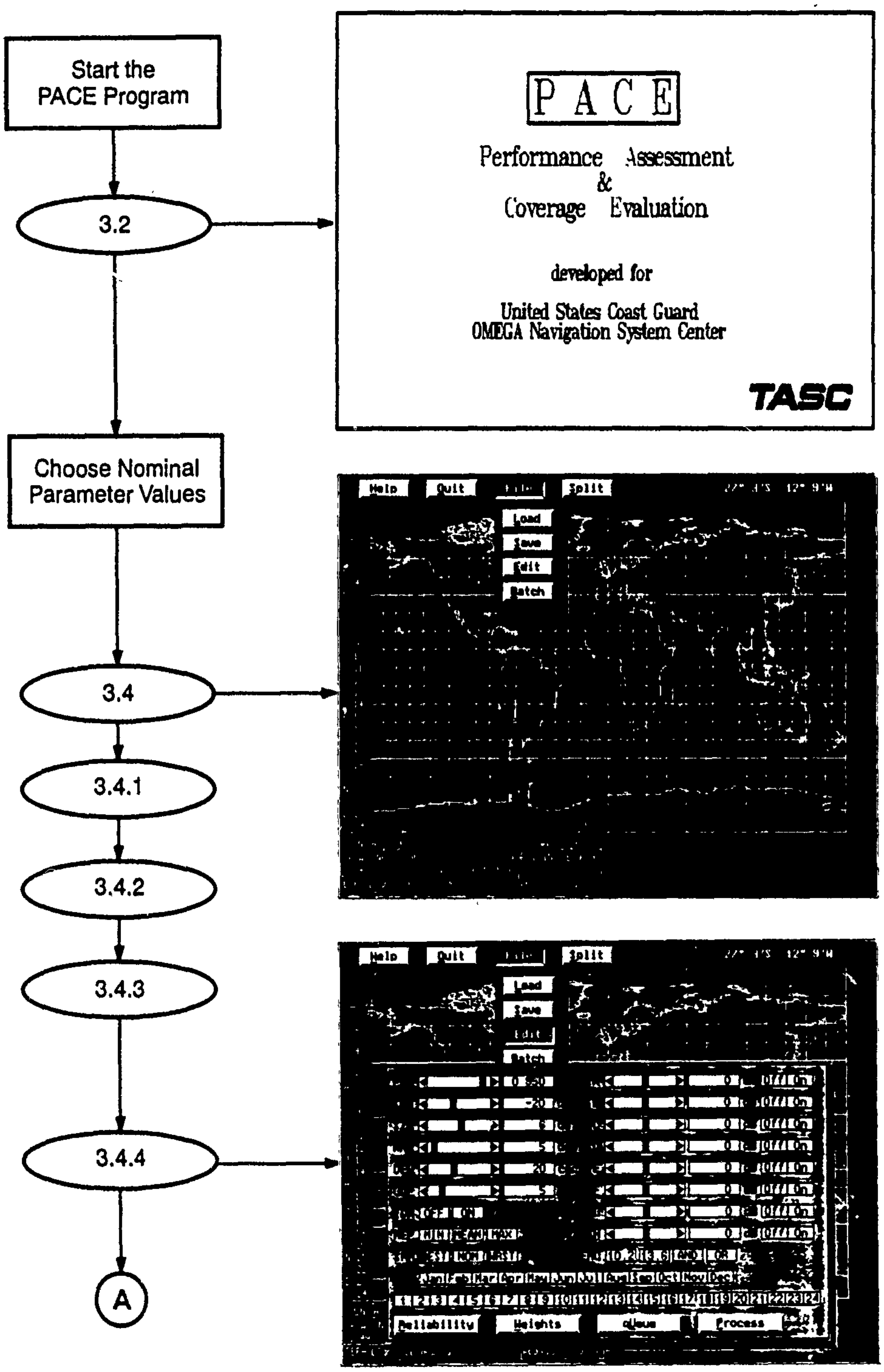

Figure 2.2-1 Baseline Scenario Computation

G-23419
1-10-91

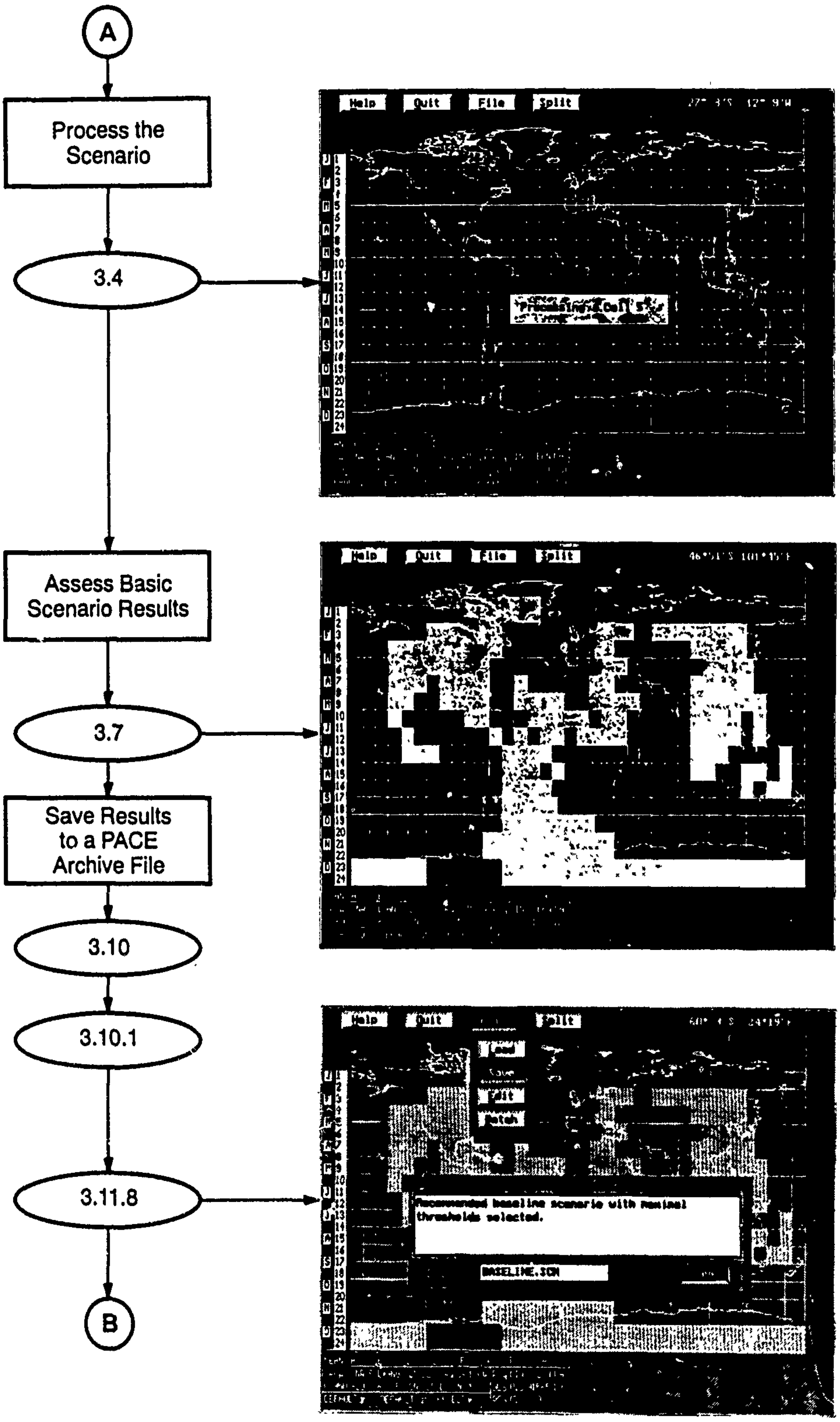

Figure 2.2-1 Baseline Scenario Computation (Continued)

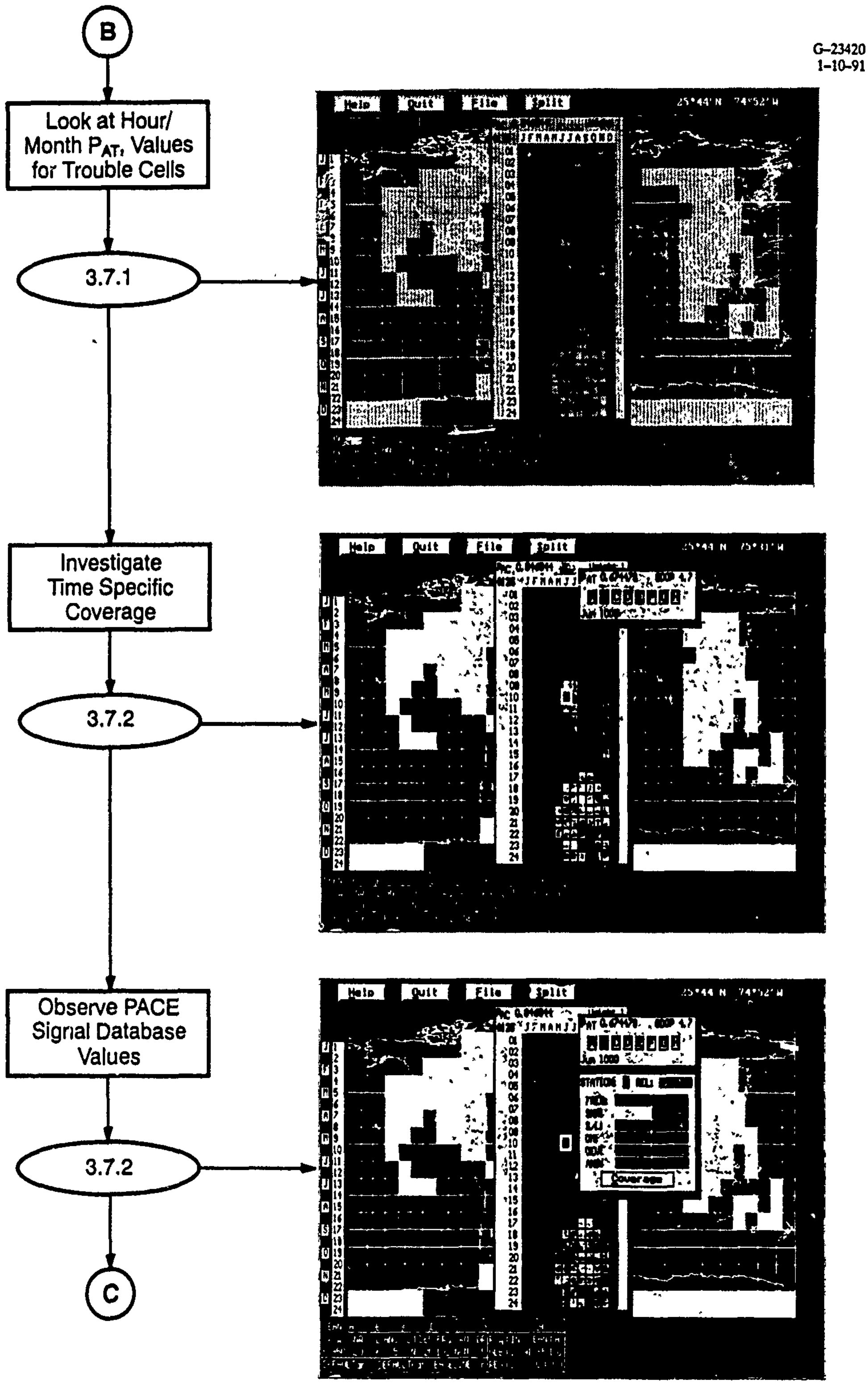

Figure 2.2-1 Baseline Scenario Computation (Continued)

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1-10-91

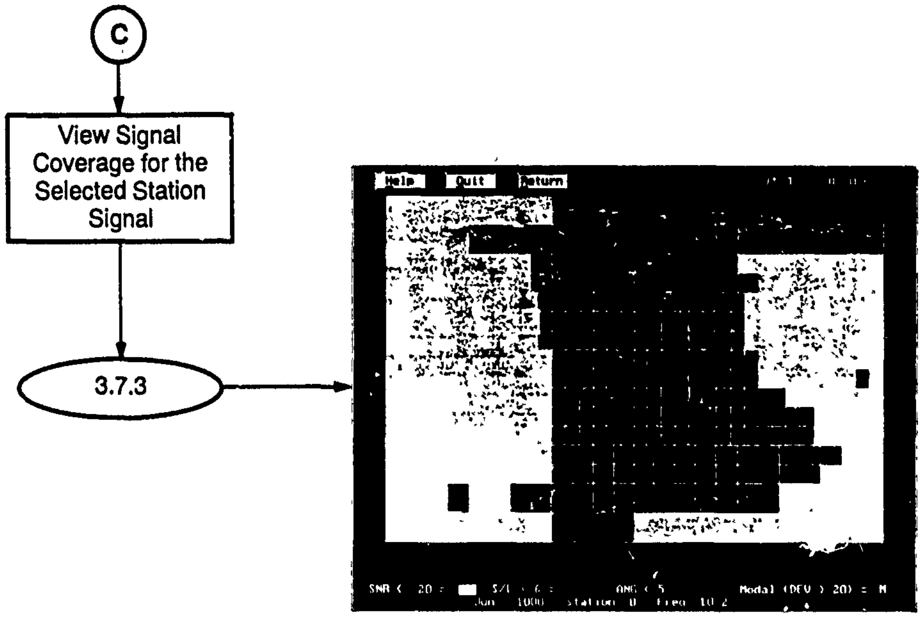

Figure 2.2-1 Baseline Scenario Computation (Continued)

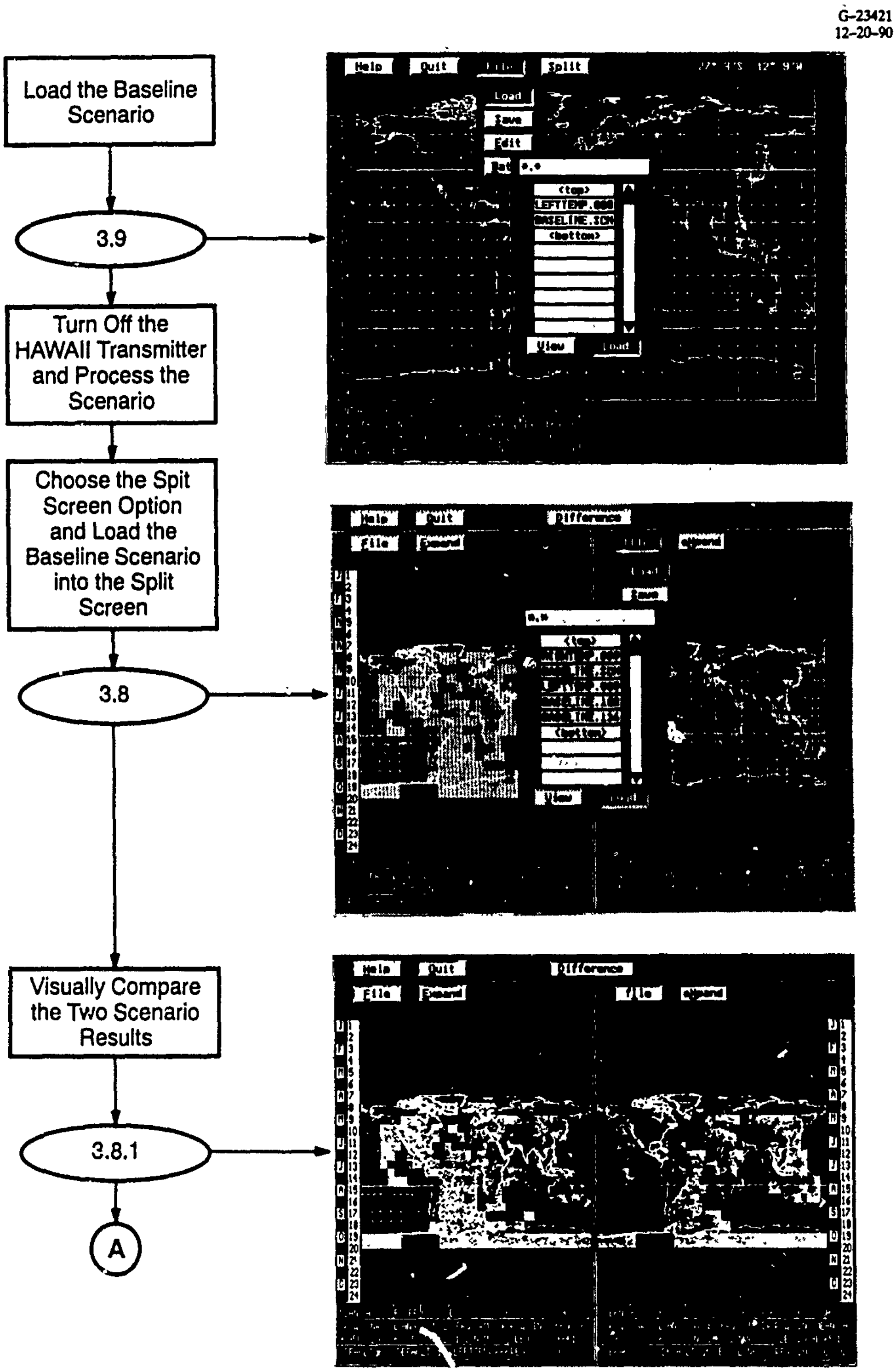

Figure 2.2-2 Variation on the Baseline Scenario

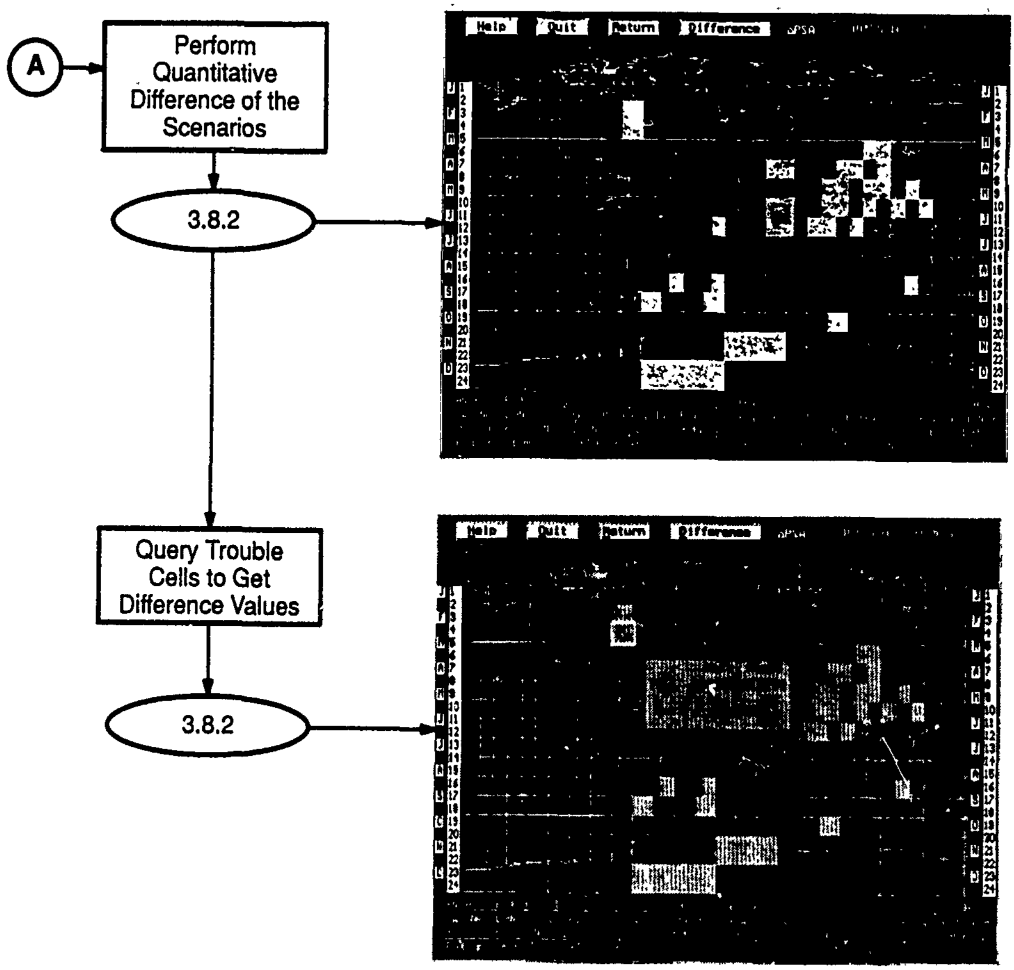

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Figure 2.2-2 Variation on the Baseline Scenario (Continued)

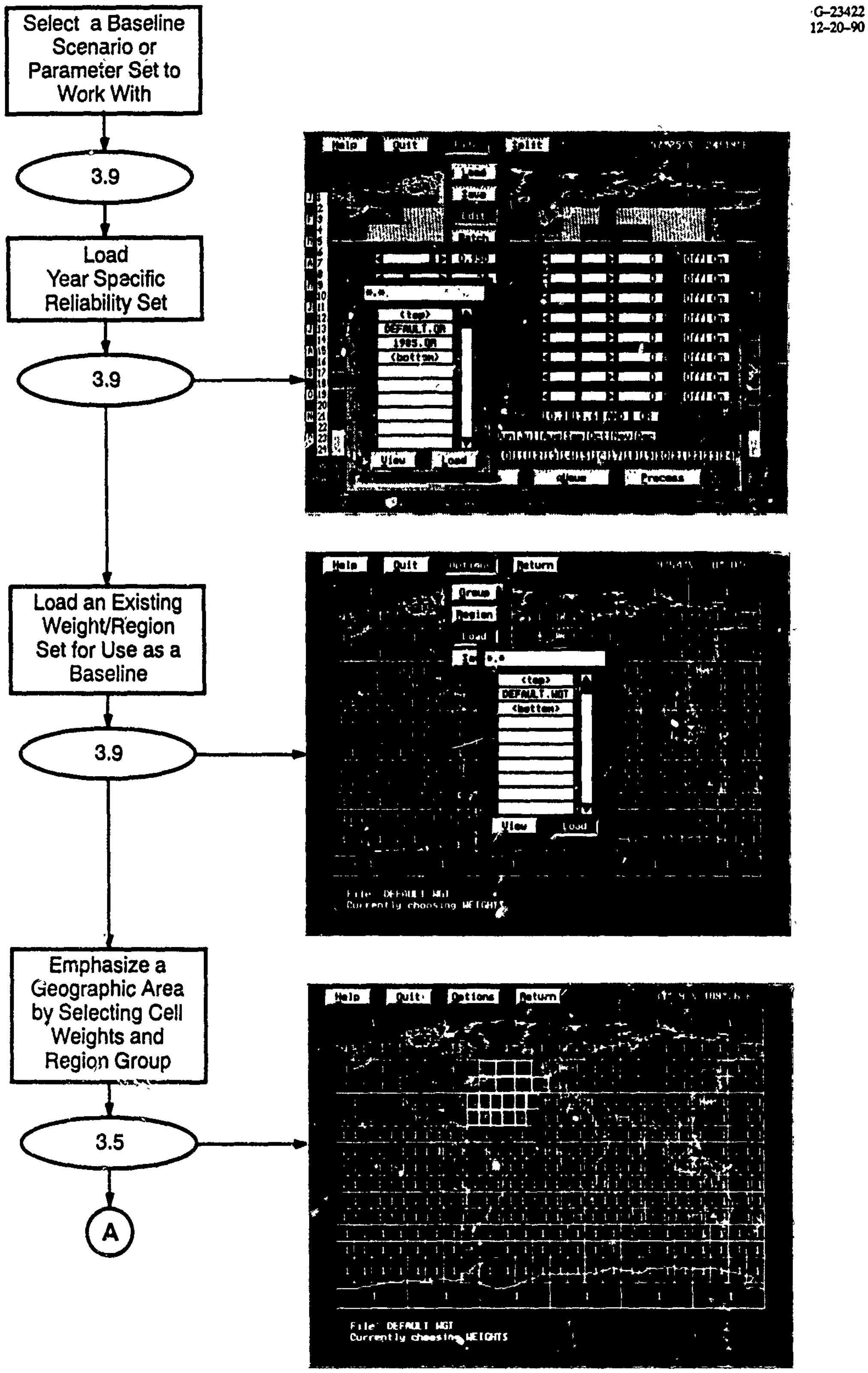


Figure 2.2-3 Advanced Scenario Processing

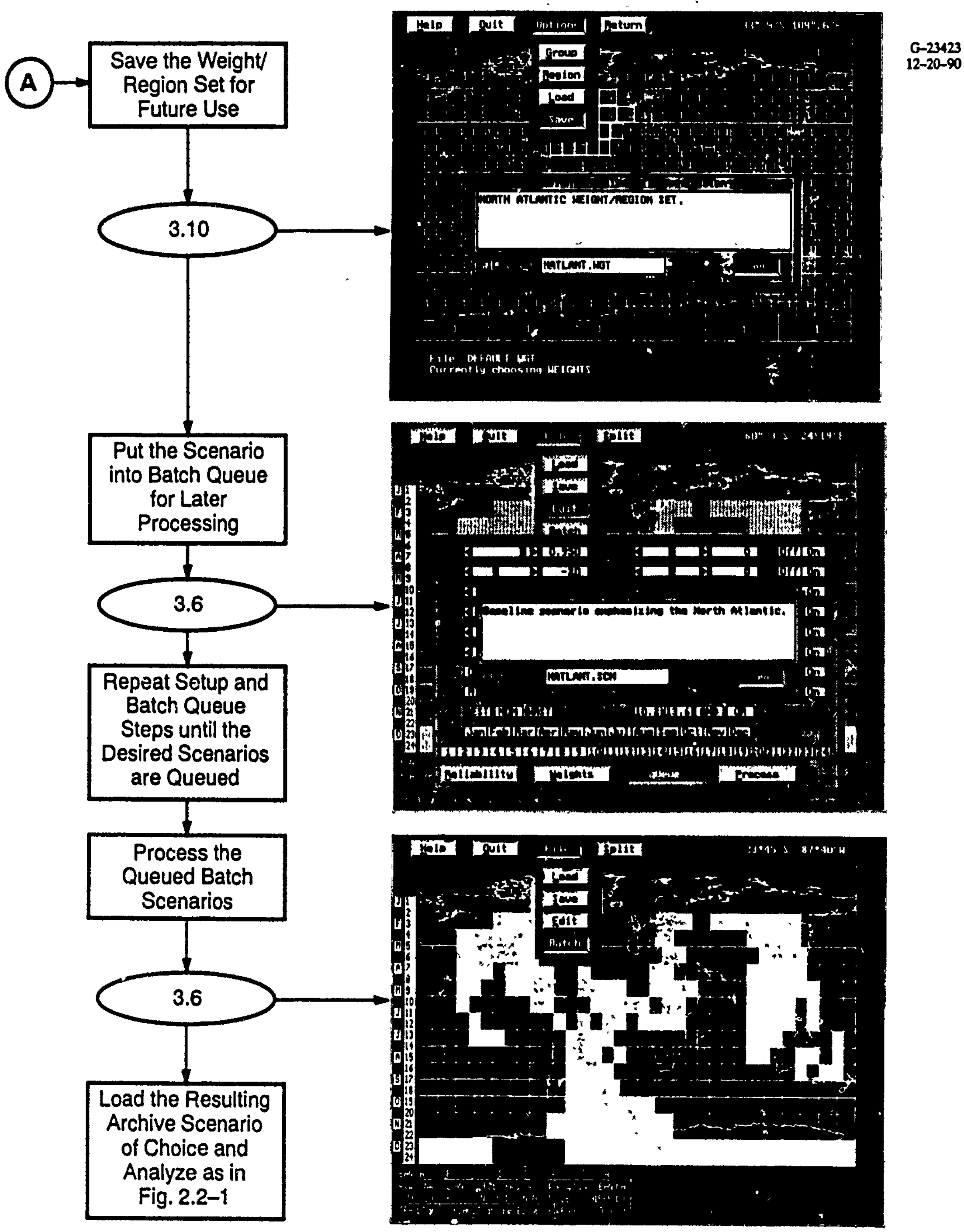


Figure 2.2-3 Advanced Scenario Processing (Continued)

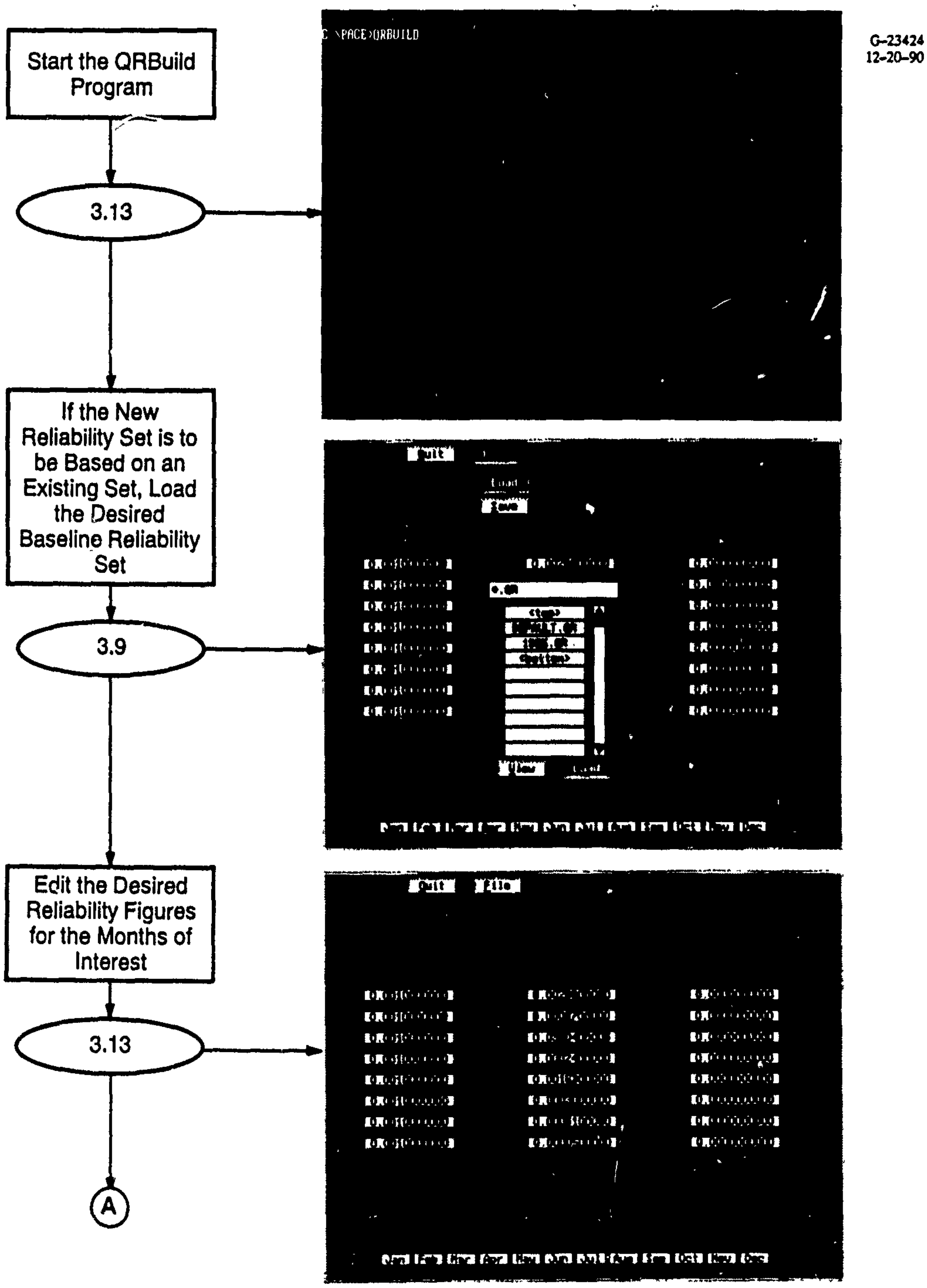


Figure 2.2-4 Building a Reliability Set

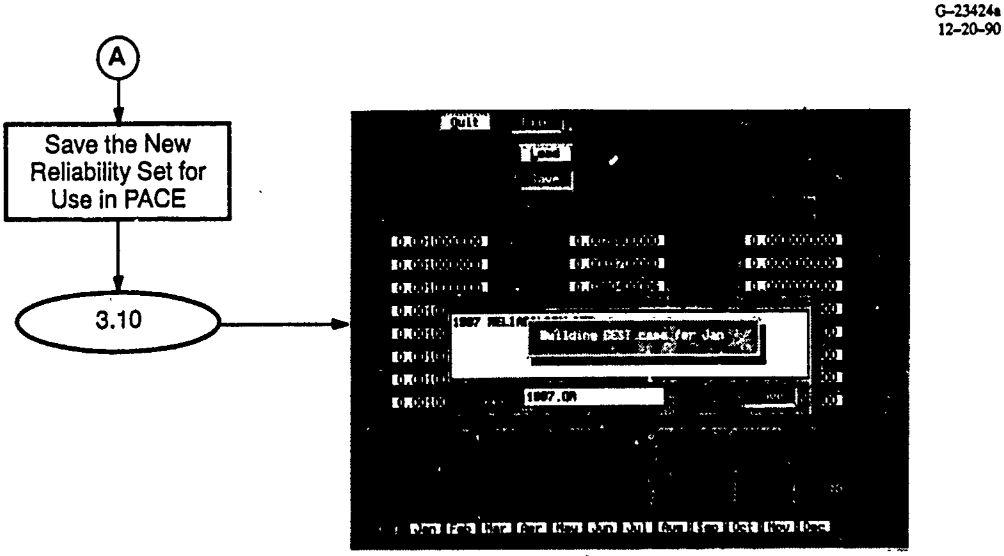


Figure 2.2-4 Building a Reliability Set

3. DETAILED OPERATIONAL INSTRUCTIONS

3.1 PACE MANUAL PAGE FORMAT

This section contains detailed instructions for operating the PACE system. As illustrated in Fig. 3.1-1, each topic in this section is addressed as a concise list of operating instructions and, if appropriate, a graphic that illustrates what is shown on the corresponding PACE display screen. The operating instructions state the objective of the action named at the top of the page (e.g., File Loading), the steps required to achieve that objective, special notes and/or warnings that may occur during the steps, and a summarization of the expected outcome of the steps. The textual instructions contained in this section of the User Manual are also present in the on-line PACE help system. For objectives that result in a unique PACE display, a graphic is also included that shows what the PACE screen should look like after the steps have been completed. Each combination of textual and graphical instructions/results addresses one or more actions that specifically relate to achieving a particular result. For example, the File Loading instructions (Section 3.9) specify all of the actions to necessary to load an archived scenario, reliability or weights file into PACE. Where applicable, references to more detailed instructions contained in other sections within this user manual are given in step descriptions. These references typically provide lower level operating instructions that are necessary to achieve the desired goal, but are too detailed to include at that particular level or that are shared across several objectives (e.g., cursor control).

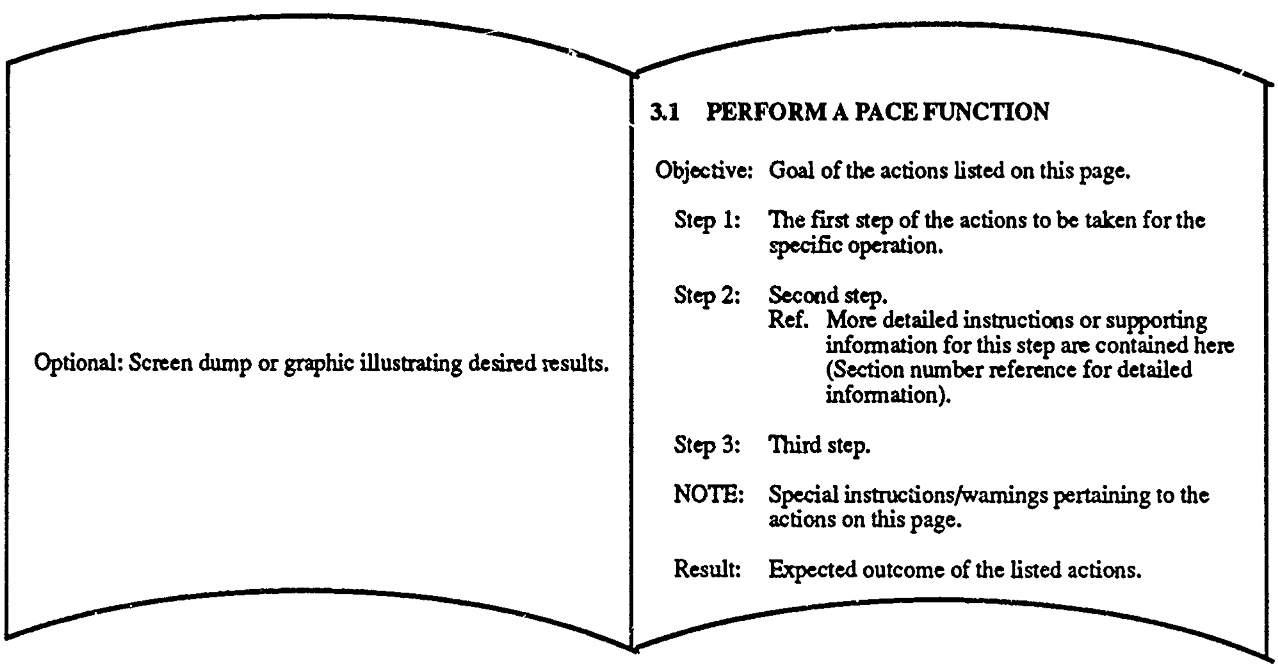


Figure 3.1-1 PACE Manual Page Format

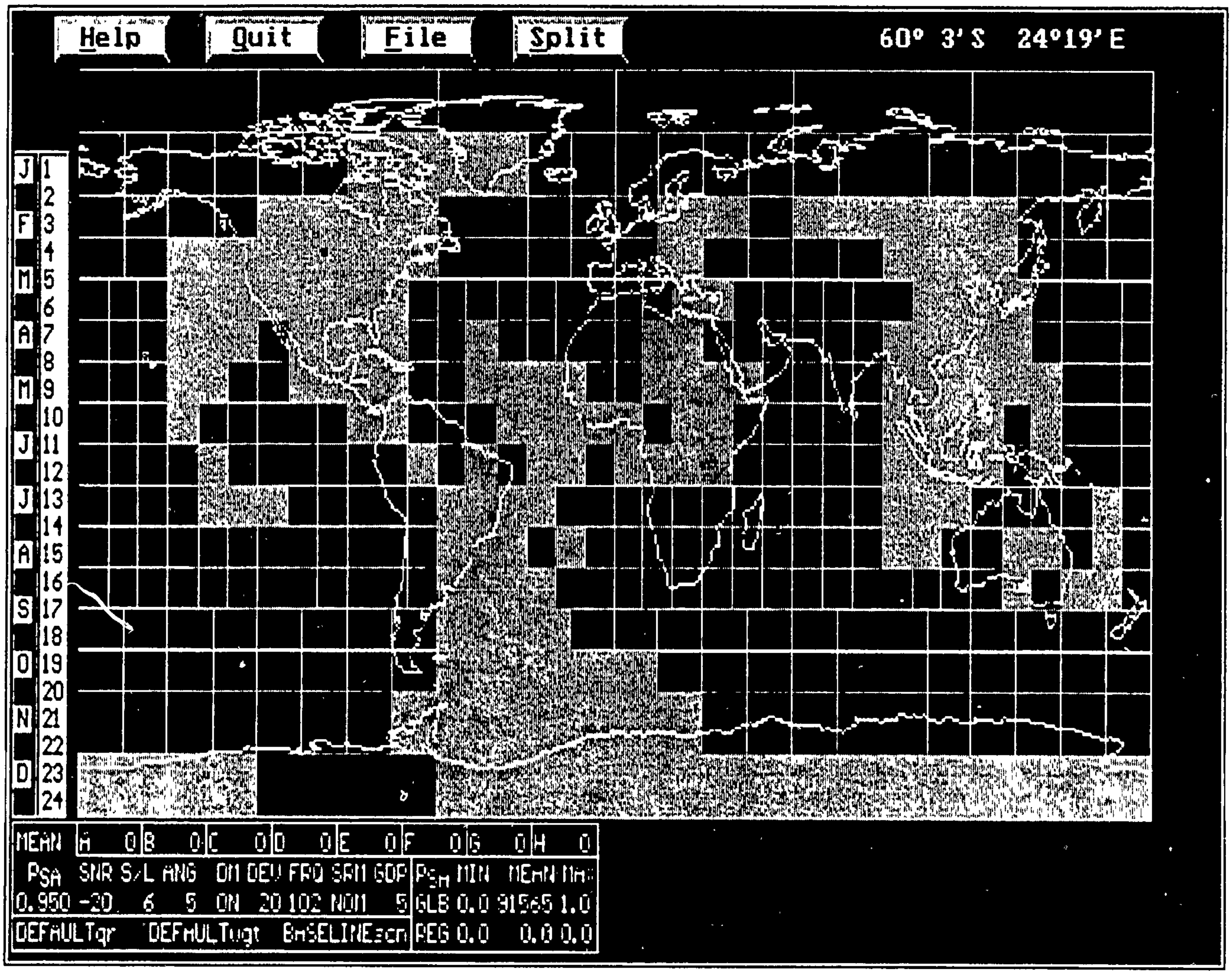


Figure 3.2-1 PACE Base Screen

3.2 STARTING PACE

Objective: Initialize the PACE system for scenario processing/review.

Step 1: At the DOS prompt, change directory to the PACE directory.
Ref: Installing PACE (Section 3.12).

Step 2: Type PACE followed by a return.

Result: The PACE initialization screen will be shown followed by the PACE base display.

3.3 ON-LINE HELP

Objective:	To obtain descriptive help information on PACE controls and operation.
Step 1:	Select the Help control to display context sensitive help.
Step 2:	Enter a new section number to jump to another help section
OR	
Step 3:	Use the Page Up and Page Down keys to page through the help screens.

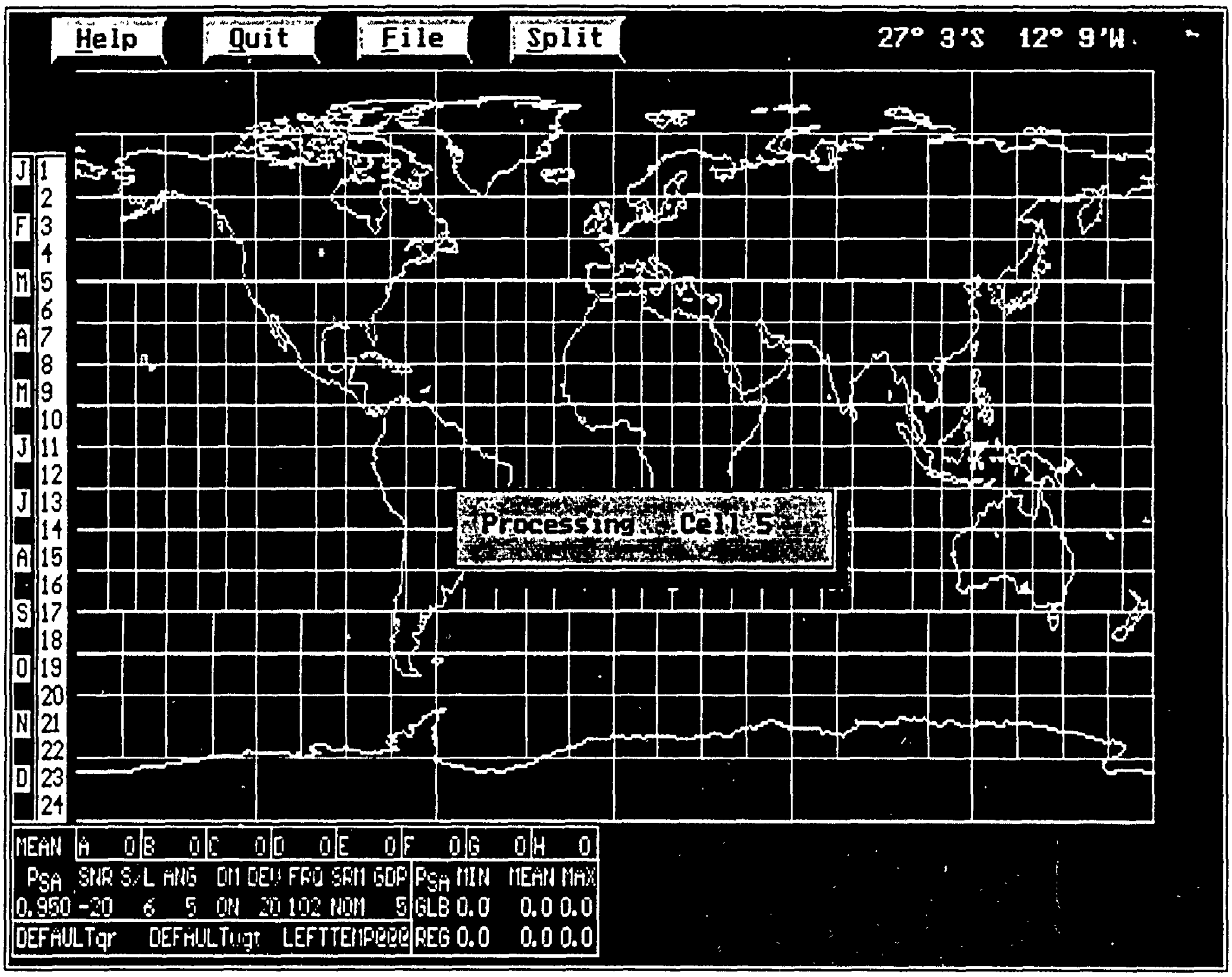


Figure 3.4-1 Scenario Processing

3.4 PROCESSING A P_{SA} SCENARIO

Objective: Compute a P_{SA} scenario using the selected parameters, and display the results.

Step 1: Set up the scenario parameters.
Ref: Scenario Set Up (Section 3.4.1).

Step 2: Select the process control in the edit menu.

Result: The screen will show the following: Status of the computing and cell loading processes; results of the computation in the cell grid display; scenario parameters in the side and lower status bars; and summary P_{SA} statistics in the lower status bar. A temporary archive file will be created to hold the scenario results.

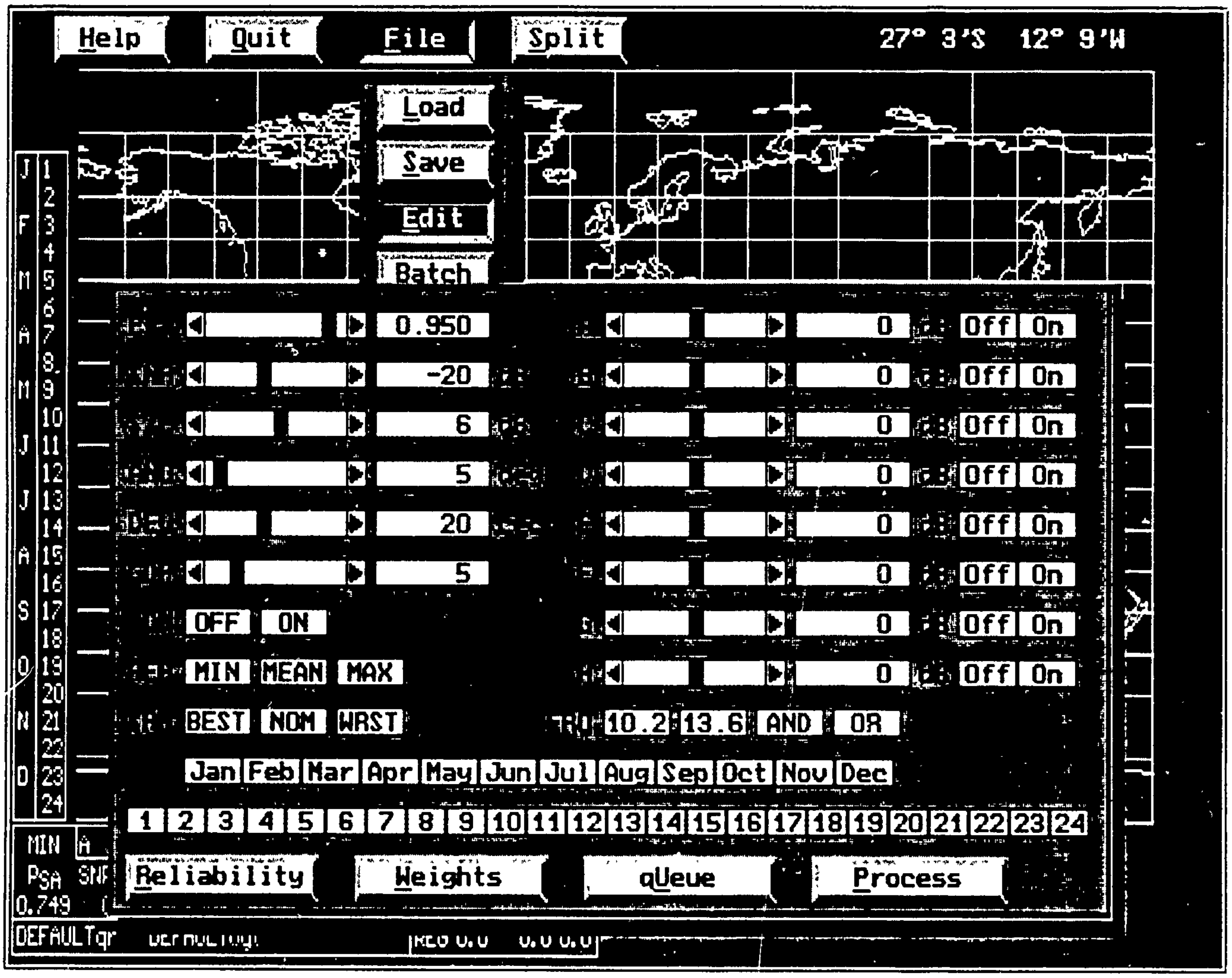


Figure 3.4.1-1 Scenario Set Up

3.4.1 Scenario Set Up

Objective: Choose coverage and calculation parameters and result thresholds.

Step 1: Select the File menu.

Ref: Cursor Control (Section 3.11.1)
Menu and Control Selections (Section 3.11)
Hot Key Selections (Section 3.11.3).

Step 2: Select the Edit option.

Step 3: Choose coverage parameters.

Ref: Coverage Parameter Selections (Section 3.4.2).

Step 4: Choose P_{SA} calculation parameters.

Ref: P_{SA} Calculation Selections (Section 3.4.3).

Step 5: Choose P_{SA} result reporting thresholds.

Ref: P_{SA} Result thresholds (Section 3.4.4).

NOTE: Cancelling the Edit window will reset the Edit menu parameters to their original values.

Ref: Cancelling Pop-Up Windows (Section 3.11.2).

3.4.2 Coverage Parameter Selections

Objective: Select parameters that determine cell coverage.

Step 1: Choose SNR, Short/Long path, phase deviation and crossing angle thresholds using the slide bar selectors.

Ref: Horizontal Slide Bar Controls (Section 3.11.7).

Step 2: Select whether or not to include the Mode 1 dominance in the coverage calculation using the DM control.

Step 3: Choose the frequency. OR will check either 10.2 or 13.6; AND will check both.

Ref: Mutually Exclusive Selections (Section 3.11.5).

Step 4: Select which stations to turn on or off, and the deviation from nominal power if on.

Ref: ON/OFF Horizontal Slide Controls (Section 3.11.6).

3.4.3 P_{SA} Calculation Selections

Objective: Select the parameters that control the creation of archive file data.

Step 1: Choose a QR set using the Reliability control and File Loading menu.
Ref: File Loading (Section 3.9).

Step 2: Choose a station reliability model using the SRM control.

3.4.4 P_{SA} Result Thresholds

Objective: Select threshold criteria for cell P_{SA} display using the currently loaded P_{SA} archive file.

Step 1: Choose a P_{SA} threshold for the cell grid display.
Ref: Horizontal Slide Bar controls (Section 3.11.7).

Step 2: Choose the hours/months for the calculation.
Ref: Selection Bar Controls (Section 3.11.4).

Step 3: Choose a reporting statistic using the REP selection control. (Min=show minimum values for hours/months selected, Mean=show mean values for hours/months selected, Max=show maximum values for hours/months selected).
Ref: Mutually Exclusive Selections (Section 3.11.5).

Step 4: Select a cell Weight/Region definition using the Weights control and the Cell Weights Editor.
Ref: Cell Weights Editor (Section 3.5).

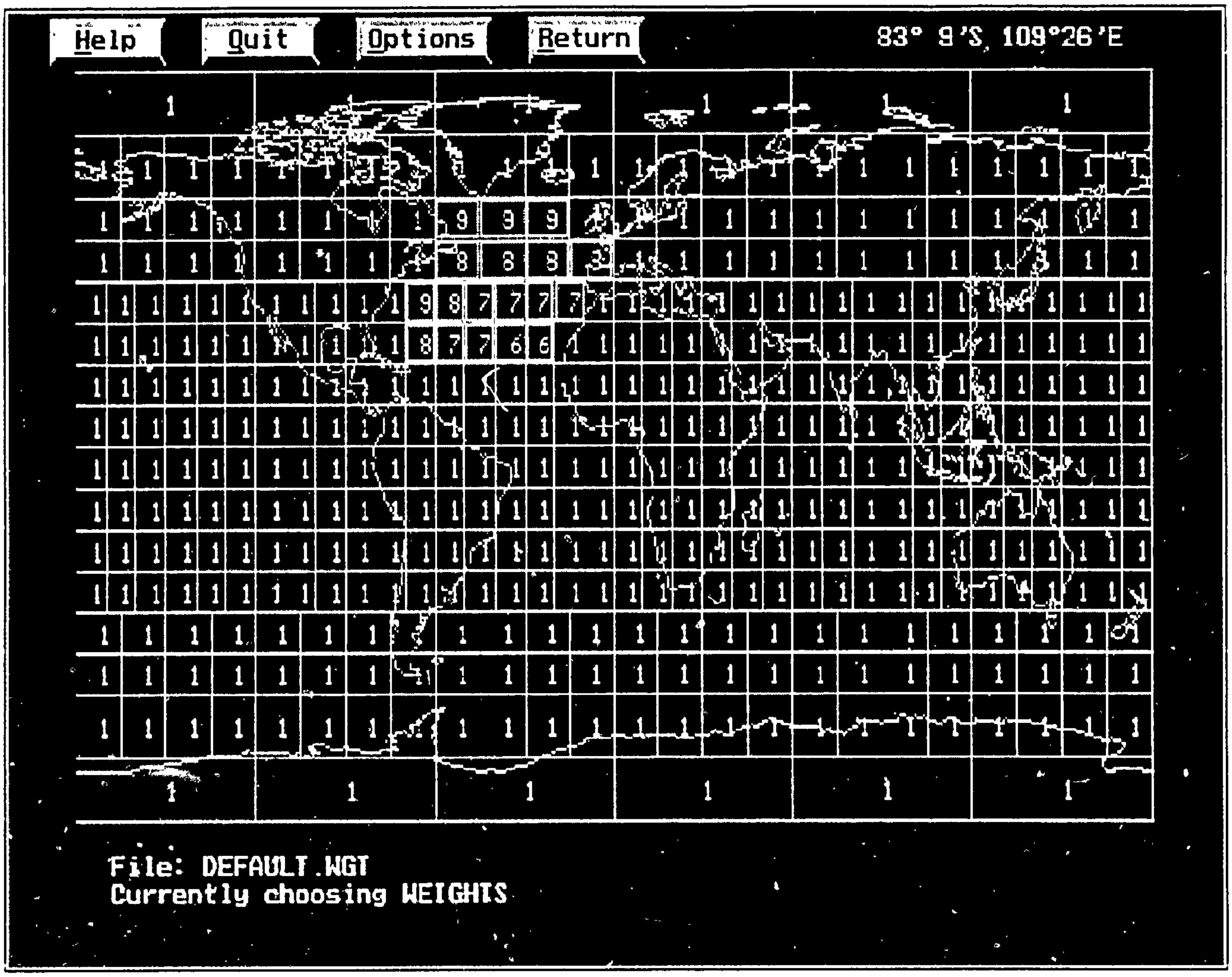


Figure 3.5-1 Weight/Region Editor

3.5 CELL WEIGHTS EDITOR

Objective:	Assign cell weights and select region cells for the cell grid display.
Step 1:	Choose the weights option from the edit menu.
Step 2:	Increase/decrease cell weights by clicking the left/right mouse buttons.
Step 3:	Use the options menu to select the region selection mode.
Step 4:	Select/deselect region cells by clicking the left/right mouse button.
Step 5:	Save the weight set by using the options followed by the save command.
Step 6:	Select the return command to return to the edit menu.
NOTE:	Cancelling the edit menu means the new weight set will not be used.
Result:	The new weight set will be used to process the next scenario.

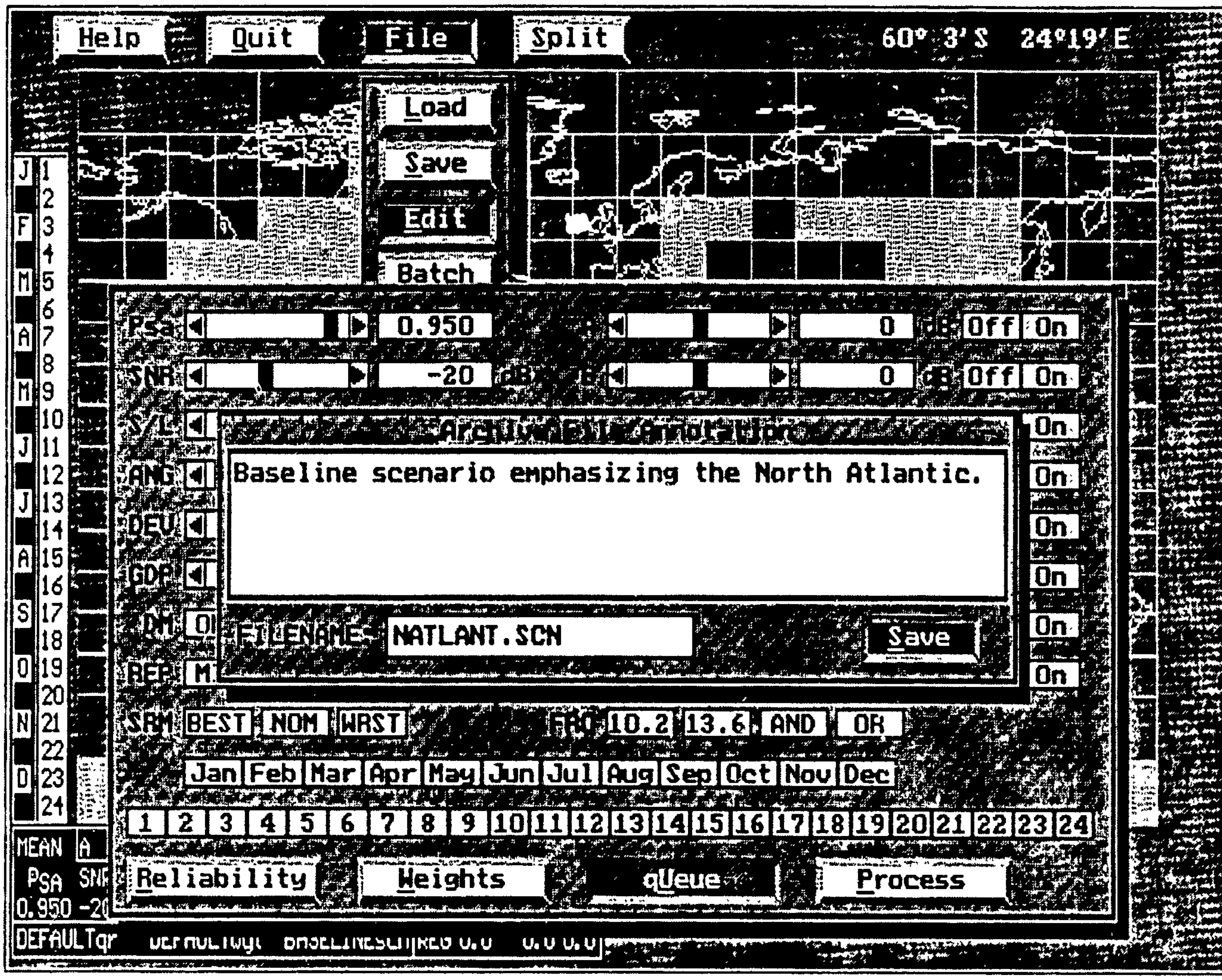


Figure 3.6-1 Queuing a Scenario for Batch Processing

3.6 PROCESSING BATCH P_{SA} SCENARIOS

Objective: To queue and subsequently process a set of scenarios.

Step 1: Set up a scenario for processing.
Ref: Scenario set up (Section 3.4.1).

Step 2: From the edit menu, select the queue command.

Step 3: Enter the archive save information and save.
Ref: Saving a scenario to an archive file (Section 3.10).

Step 4: After the desired number of scenarios have been queued, choose any file menu and then batch option to process the queued scenarios.

Step 5: To review the batch results, use the file load option to load and analyze the scenario results.
Ref: File Loading (Section 3.9).

Result: A status indicator will show which batch scenario is currently being processed. An archive file will be created for each batch scenario.

3.7 ANALYZING SCENARIO RESULTS

Objective: Obtain detailed information about a P_{SA} scenario.

Step 1: Observe the summary P_{SA} statistics displayed in the lower status bar.

Step 2: Observe the global P_{SA} results on the cell grid display.

Step 3: Perform summary cell information queries.
Ref: Summary cell queries (Section 3.7.1).

Step 4: Perform detailed cell information queries.
Ref: Detailed cell queries (Section 3.7.2).

Step 5: Display coverage information display.
Ref: Coverage information display (Section 3.7.3).

Step 6: Perform scenario variations.
Ref: Scenario variations.

Step 7: Save the desired scenario variations for later comparison and analysis.
Ref: Saving a scenario to an archive file (Section 3.10).

Step 8: Perform side by side comparison of two scenarios.
Ref: Comparing scenarios (Section 3.8.1).

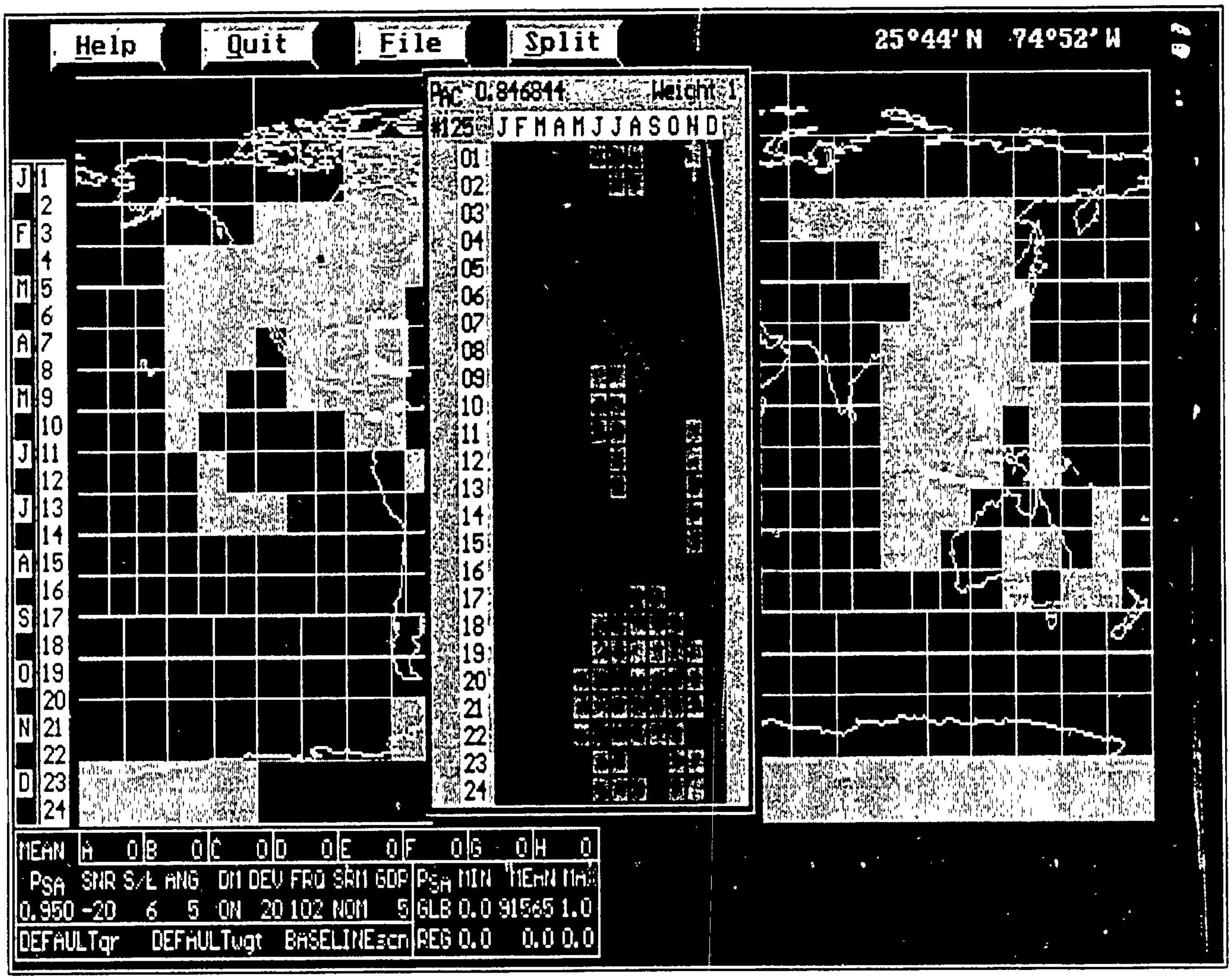


Figure 3.7-1 Summary Cell Query Display

(Note that the cell summary display panel describes cell to its immediate left)

3.7.1 Summary Cell Queries

Objective: View hour/month summary of P_{SA} results for all hours and months, the cell level P_{SA} (called P_{AC}), and other cell specific data.

Step 1: Position the on screen cursor on the cell of interest.

Step 2: Select the cell summary display by pressing the left mouse button or by using the keyboard enter key.

NOTE: Cells do not highlight as most of the other controls do when the mouse is in position to activate it.

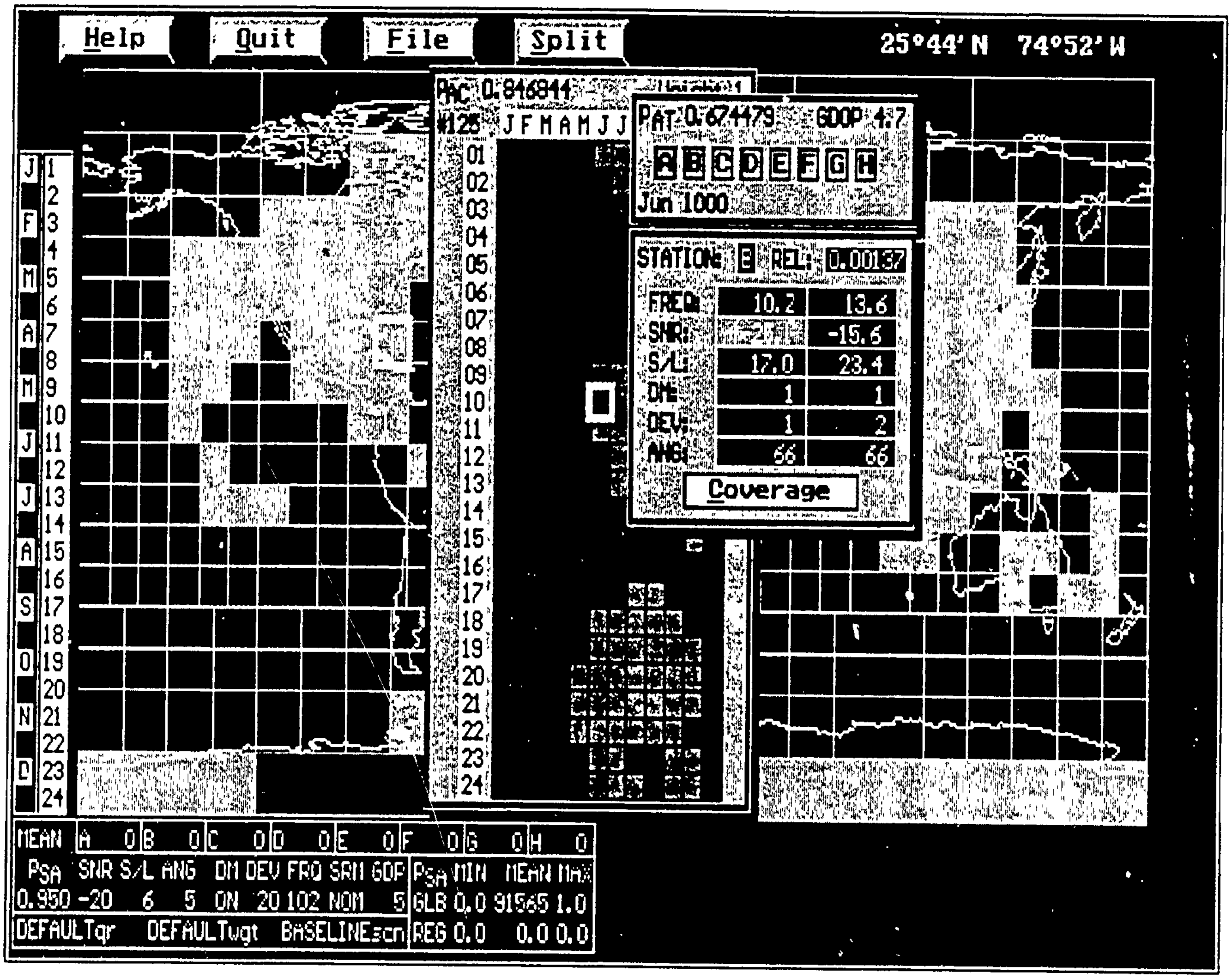


Figure 3.7-2 Detailed Cell Query Display

3.7.2 Detailed Cell Queries

Objective: To show coverage and to observe PACE database information for any individual hour/month.

Step 1: On the summary cell information window, select an hour/month for further investigation.

Step 2: View the covering stations, P_{AT} and GDOP information for the time selected.

Step 3: Choose a station selector to obtain signal characteristics for that station from the PACE database.

Step 4: Select the coverage command button to view a summary display of signal coverage for the time and station selected.
Ref: Coverage information display (Section 3.7.3).

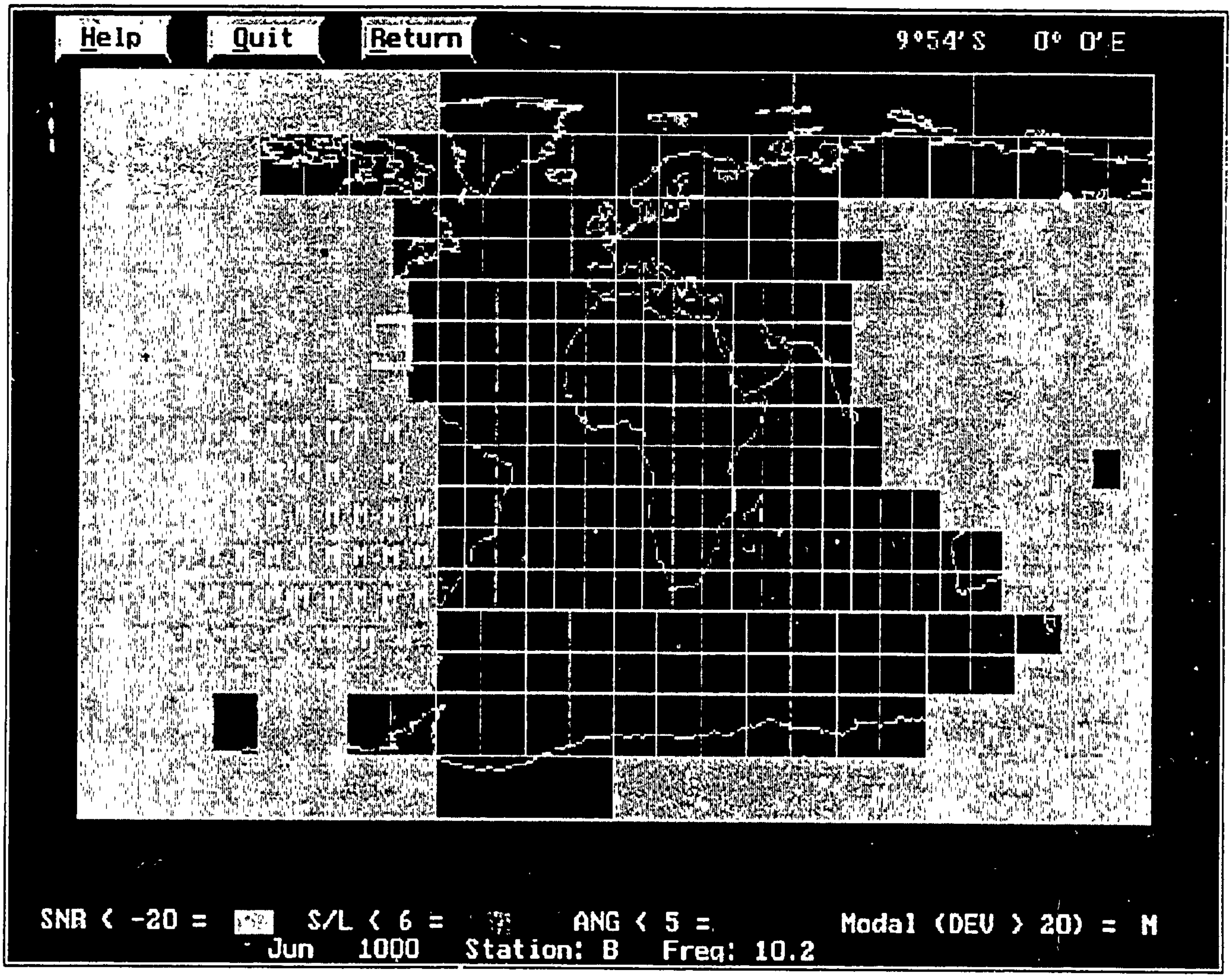


Figure 3.7-3 Coverage Display

3.7.3 Coverage Information Display

Objective: To assess signal coverage characteristics for a specific station, hour, and month.

Step 1: From the detailed cell query level, select a station to view.

Step 2: Select the coverage control.

Result: The signal coverage for the selected station at the time of interest will be shown on a cell grid.

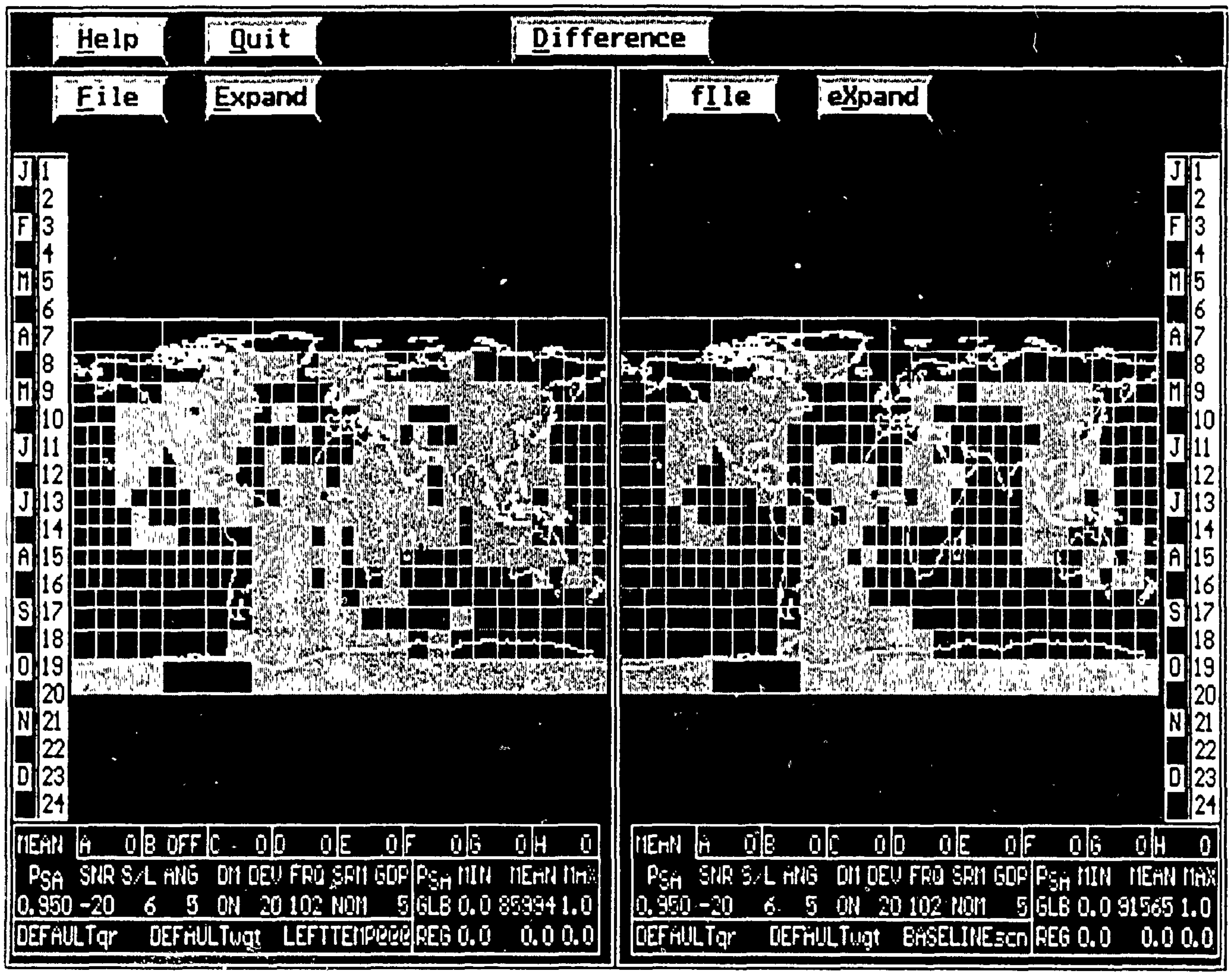
3.8 SCENARIO VARIATIONS

Objective: To assess changes in P_{SA} resulting from changes in the input parameter set.

Step 1: Process a base scenario using a baseline parameter set.
Ref: Processing a P_{SA} scenario (Section 3.4).

Step 2: Set up a new scenario by changing the desired parameter(s) and re-processing.

Step 3: Assess the scenario results and save to a scenario archive file if desired.
Ref: Analyzing scenario results (Section 3.7).
Saving a scenario to an archive file (Section 3.10).



F[illegible] 8-1 Split Screen Display

3.8.1 Comparing Scenarios

Objective: Perform side-by-side and direct comparisons of two scenarios.

Step 1: At the base screen level, select the split option.
Ref: Menu and control selections (Section 3.11).

Step 2: For the cell grid window where a new scenario is desired, select the file menu and load option to load an archived scenario.
Ref: File loading (Section 3.9).

OR

Step 2: For the desired cell grid window, process a new P_{SA} scenario.
Ref: Processing a P_{SA} scenario (Section 3.4).

Step 3: Observe and assess differences in the cell grid displays and summary statistics.

Step 4: As desired, perform summary and detailed cell queries on either scenario.
Ref: Summary cell queries (Section 3.7.1).
Detailed cell queries (Section 3.7.2).

Step 5: Use the Difference Option to analyze the difference in the two scenarios.
Ref: Differencing two scenarios (Section 3.8.2).

Step 6: Optionally expand a cell grid for better viewing.
Ref: Expanding the split screen (Section 3.8.3).

Result: The display will contain two complete cell grid displays.

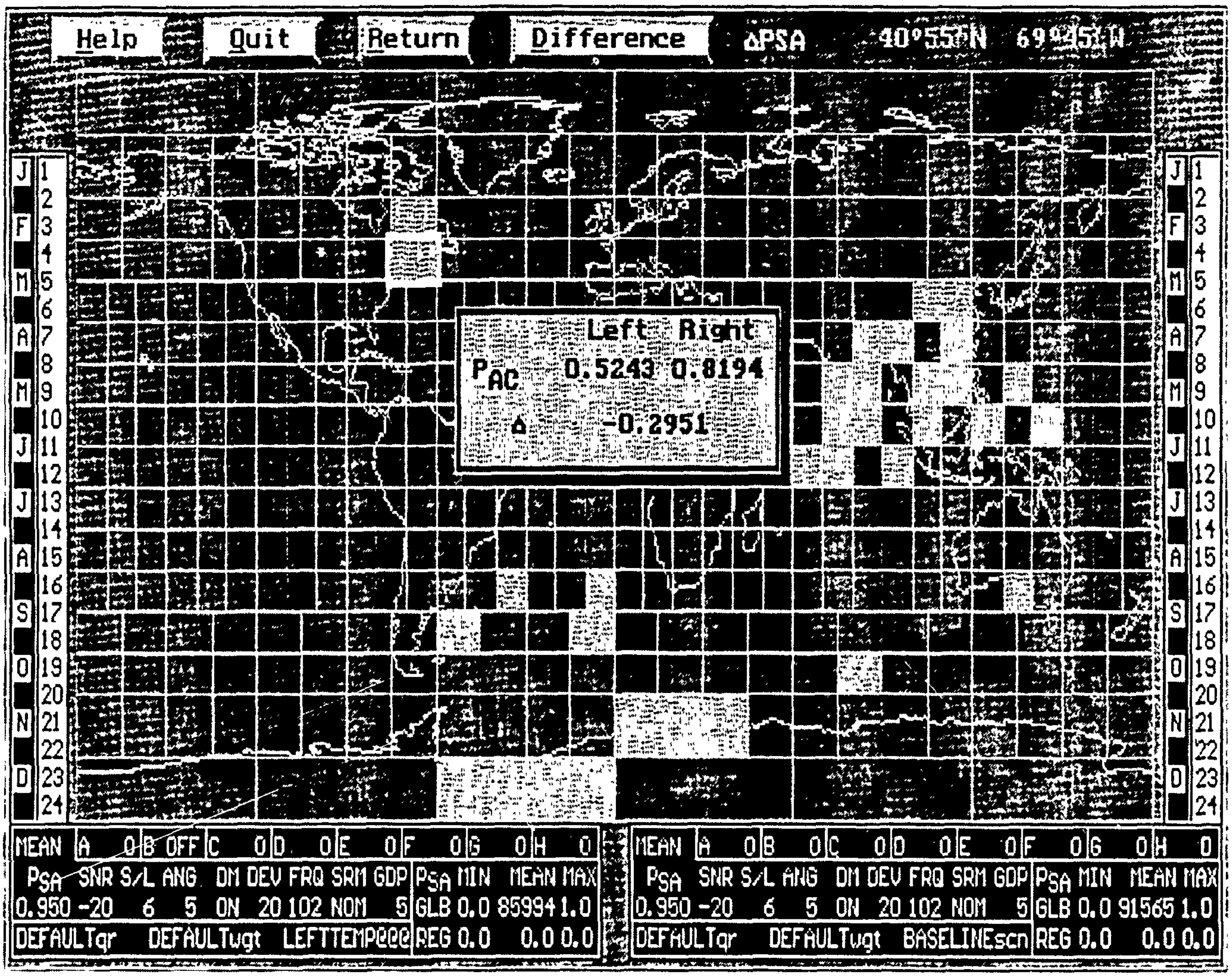


Figure 3.8-2 Difference Display

3.8.2 Differencing Two Scenarios

Objective: To quantitatively assess the differences between two P_{SA} scenarios.

Step 1: From the split screen display, choose the difference control.

Step 2: Choose a differencing method (straight difference, fractional change in system availability, fractional change in system unavailability).

Result: A cell grid display of the scenario differences.

3.8.3 Expanding The Split Screen

Objective: To view either split screen scenario in the full screen cell grid.

Step 1: Select the expand control that corresponds to the scenario to be expanded.

Ref: Menu and Control Selections (Section 3.11).

NOTE: The status bars corresponding to the selected scenario will appear on the same side as in the split screen mode. The scenario that is not selected for expansion is saved and restored upon a subsequent split operation.

Result: Full screen display of the selected scenario.

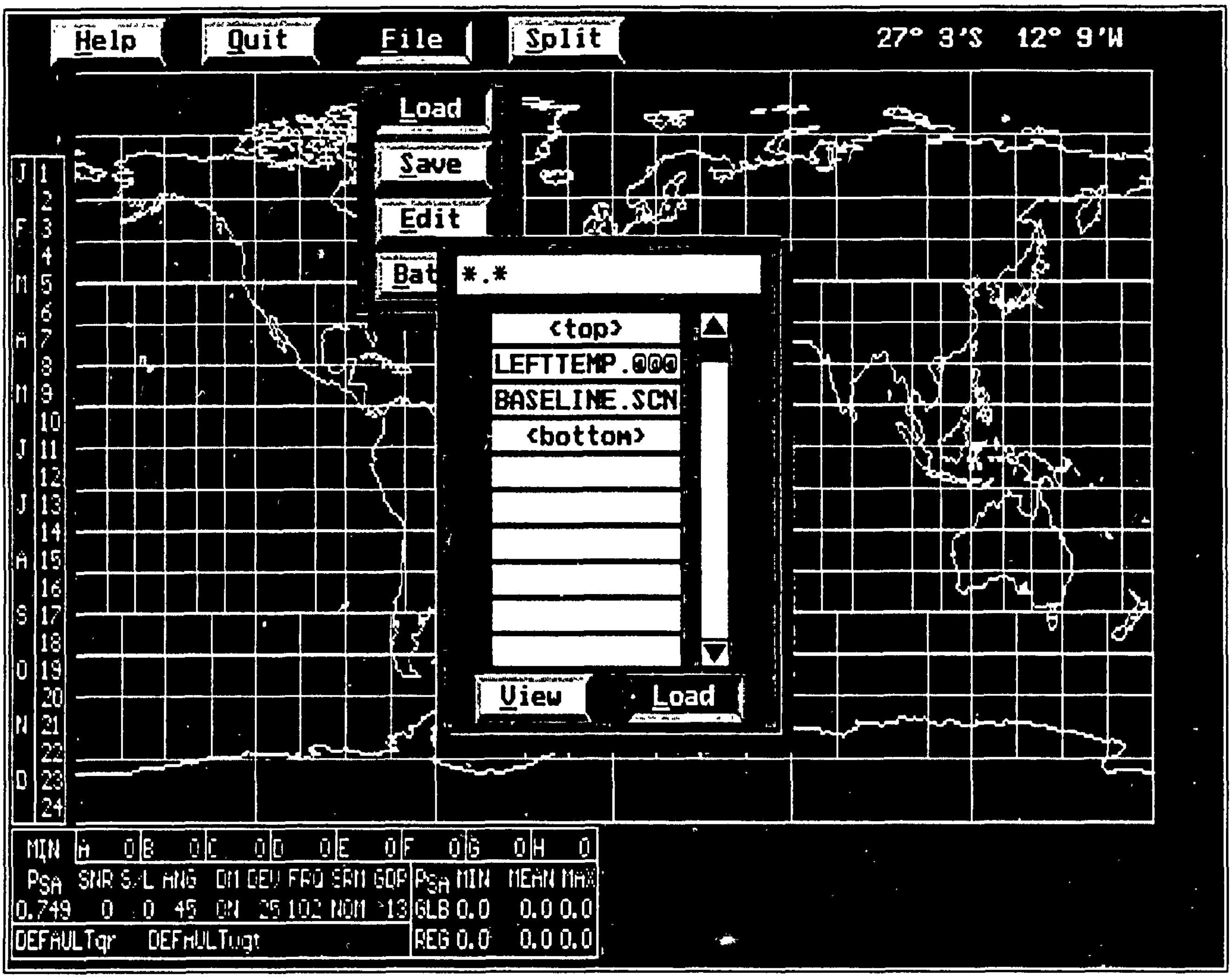


Figure 3.9-1 File Loading Menu

3.9 FILE LOADING

Objective:	To load an archive, reliability, or weights file into PACE.
Step 1:	Use the vertical slide bar to scroll through a file list until the desired file appears in the list. Ref: Vertical Slide Bar Operation (Section 3.11.9).
Step 2:	Position the cursor over the desired file name and select. Ref: Mutually Exclusive Selections (Section 3.11.5).
Step 3:	Select the View control to display the comment area for the selected file.
Step 4:	Select the Load control to load the file.
Result:	The selected file will be loaded for use in scenario computations.

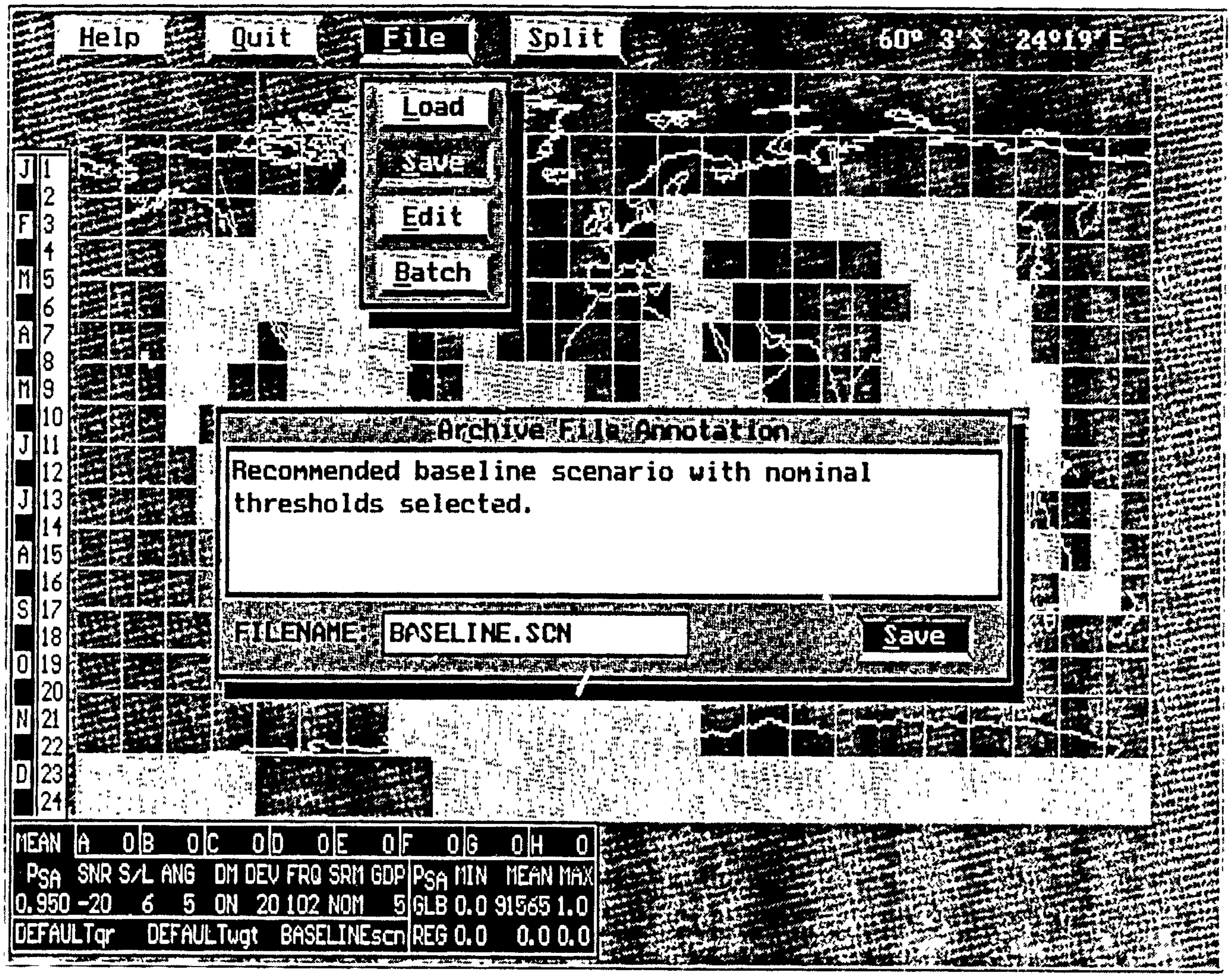


Figure 3.10-1 File Save Control Screen

3.10 SAVING A SCENARIO TO AN ARCHIVE FILE

Objective: Save a scenario's parameters and results permanently in a PACE archive file.

Step 1: From the file menu corresponding to the desired scenario's window, select the save option.
Ref: Menu and control selections (Section 3.11).

Step 2: Select the comment entry area and type in a descriptive comment about the scenario.
Ref: Comment window input (Section 3.10.1).

Step 3: Enter the file name to use for scenario storage.
Ref: Using the Edit buttons (Section 3.11.8).

Step 4: Select the save command to save the comment and scenario to the indicated file.

Result: Status window indicating the name of the file to which the scenario is being saved.

3.10.1 Comment Window Input

Objective: To enter a descriptive comment to be saved with an archived scenario.

Step 1: In the save menu, select the comment area to activate text input.
Ref: Menu and Control Selections (Section 3.11).

Step 2: Use the keyboard arrow keys to position the cursor at the place where text insertion is desired.

Step 3: Type in a descriptive comment, using the Backspace and Delete keys to correct errors. Continuous typing will automatically wrap to the next line.

Step 4: Use the Home and End keys to jump to the start or end of a line.

Step 5: Use the Control-End key combination to delete from the cursor position to the end of the line.

Step 6: Save the comment by pressing the keyboard Enter key or left mouse button.

OR

Step 6: Abort and return to the previous comment by pressing the ESC key or right mouse button.

3.11 MENU AND CONTROL SELECTIONS

Objective: Activate or Select a PACE menu or control.

Step 1: Position the cursor over the item to be selected. (Most controls and selectors will highlight when the cursor is within their activation area.)

Ref: Cursor Control (Section 3.11.1).

Step 2: Click the Left mouse button OR use the keyboard enter key to activate the control.

Ref: Cancelling Pop-Up Windows (Section 3.11.2).

OR

Step 1: Use the keyboard key that corresponds to the control "hot key" to activate the control.

Ref: Hot Key Selections (Section 3.11.3).

3.11.1 Cursor Control

Objective: Position the cursor on the desired object.

Step 1: Roll the mouse to move the on-screen cursor.

OR

Step 1: Use the Up, Down, Left and Right keyboard arrow keys to jump the cursor in 8 pixel increments.

Step 2: Toggle the keyboard insert key to make the keyboard arrow keys move in 1 pixel increments.

OR

Step 1: Use the keyboard tab key or shift-tab key to jump the cursor forward or backward to the next selector button or control.

NOTE: Controls that are mouse specific will not highlight using the tab or shift-tab keys.

3.11.2 Cancelling Pop-Up Windows

Objective: To remove a window from the display and re-display the area beneath it.

Step 1: Push the right mouse button once for each window to be popped down.

OR

Step 1: Use the keyboard ESC key to cancel a window.

3.11.3 Hot Key Selections

Objective: Single keystroke activation for selected controls.

Step 1: Press the keyboard key that corresponds to the control hot key (indicated by a capital letter and small underline bar).

Ref: Cancelling pop-up windows (Section 3.11.2).

3.11.4 Selection Bar Controls

Objective: To activate a group of related selections.

Step 1: Position the cursor over the item to be turned on or off and select it. Repeated selections of an item will toggle it between the on and off state.

3.11.5 Mutually Exclusive Selections

Objective: To choose one of several choices for a parameter value.

Step 1: Position the on-screen cursor over the desired parameter option.

Step 2: Press the left mouse button.

Result: The selection option will change color to indicate the current choice.

3.11.6 ON/OFF Horizontal Slide Controls

Objective: To optionally activate/deactivate a horizontal slide bar parameter.

Step 1: If the OFF state is desired, select the OFF control button near the horizontal slide bar.

Ref: Mutually Exclusive Selections (Section 3.11.5).

Step 2: If the ON state is desired, select the ON control.

Step 3: Enter the desired value using the horizontal slide bar control.

Ref: Horizontal Slide Bar Controls (Section 3.11.7).

3.11.7 Horizontal Slide Bar Controls

Objective: To select a parameter value using the horizontal slide bar control.

Step 1: Position the On screen cursor over the slider control on the slide bar.

Step 2: Press and HOLD down the left mouse button.

Step 3: With the left button still pressed, move the mouse left or right to increase or decrease the parameter value.

Step 4: When the desired value is obtained, release the left mouse button.

OR

Step 1: Click on the left or right arrows at either end of the slide bar to decrease or increase the parameter value.

OR

Step 1: Click on the parameter value display area.

Step 2: Click the right mouse button or press the keyboard ESC to abort and retain the previous value.

Step 3: Type in a new value using the keyboard.

Step 4: Press the keyboard enter key or the left mouse button to accept the new value.

3.11.8 Using The Edit Buttons

Objective: To enter or edit a text parameter.

Step 1: Select the Edit button corresponding to the desired parameter.
Ref: Menu and Control Selections (Section 3.11).

Step 2: Use the keyboard arrow keys to place the cursor where text insertion is desired.

Step 3: Type in the desired text, using the Backspace and Del keys to correct errors.

Step 4: Use the Home and End keys to jump to the start or end of the text.

Step 5: Use the Control-End key combination to delete from the cursor position to the end of the text.

Step 6: Save the text by pressing the keyboard Enter key or the left mouse button.

OR

Step 6: Abort and retain the previous text by pressing the keyboard ESC key or right mouse button.

3.11.9 Vertical Slide Bar Operation

Objective: To scroll the contents of the file selection menu.

Step 1: Position the cursor over the slide in the vertical slide bar.
Ref: Cursor control (Section 3.11.1).

Step 2: Press and HOLD the left mouse button.

Step 3: With the left mouse still depressed, roll the mouse up or down.

Step 4: Release the mouse button.

OR

Step 1: Select the up or down arrow controls on either end of the slide bar to scroll the window up or down one file at a time.

3.12 INSTALLING PACE

Objective: To install the PACE operational software and required data files, and to configure the PACE directories.

Step 1: Insert the PACE installation diskette into the floppy drive.

Step 2: Type Install at the A: prompt and follow the ensuing instructions.

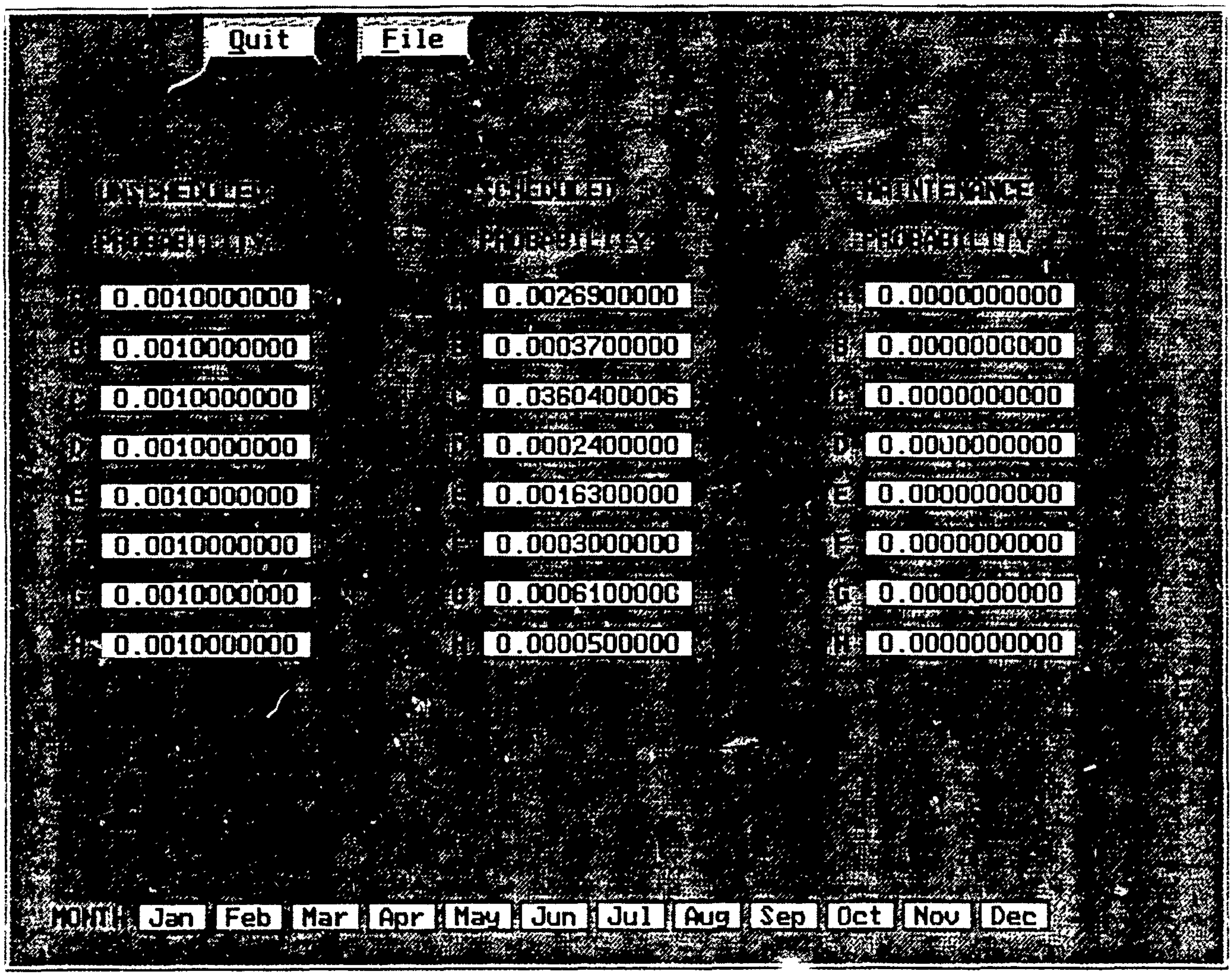


Figure 3.13-1 Reliability Set Editor

3.13 BUILDING RELIABILITY SETS

Objective: To construct a station reliability set and resulting QR file to be used in PACE.

Step 1: At the DOS prompt, type QRBUILD to start up the QR builder.

Step 2: If a change to an existing reliability set is desired, select the file menu load option to load an existing reliability set.
Ref: File Loading (Section 3.9).

Step 3: Use the month selection bar to choose the station reliabilities for a given month.
Ref: Mutually Exclusive Selections (Section 3.11.5).

Step 4: Edit the station reliability numbers as desired.

Step 5: Use the file menu save option to process and save the reliability set.
Ref: Saving a scenario to an archive file (Section 3.10).

NOTE: The QR builder initializes with a set of "standard" reliability numbers.

3.14 QUITTING PACE

Objective: To terminate PACE Execution and return control to DOS.

Step 1: Select the Quit option.

Ref: Menu and Control Selections (Section 3.11).

Note: If unsaved scenarios exist when quit is selected, the user is given a chance to save them.

REFERENCES

1. Morris, P.B., Omega System Performance Assessment, TASC, Technical Report TR-5351-8-1, March 1989.
2. Morris, P.B., Enhancement of the Omega System Availability Algorithm, TASC, Technical Information Memorandum TIM-5834-1-1, March 1990.